

ACADEMIC HANDBOOK



Doctor of Forestry Science Study Program,
Faculty of Forestry

UGM
2023

ACADEMIC HANDBOOK
DOCTOR in FOREST SCIENCE STUDY PROGRAM

Author : Dr. Ir. Eny Faridah, M.Sc.,
Dr. Ir. Hero Marhaento, S.Hut., M.Si
Reviewers : Prof. Dr. Ir. Suryo Hardiwinoto,
Prof. Dr. Ir. Ambar Kusumandari, M.P.,
Dr. Ir. Muhammad Navis Rofii, S.Hut.,M.Sc.,
Prof. Dr. Ir. Ris Hadi Purwanto, M.Agr.Sc.

Content Design : Deje
Cover Design : Mangun_art
Cover Photo Source : UGM Public Relations
First Print, 2023

Published by:
Faculty of Forestry UGM

Foreword

Thanks to the grace of the Almighty God, the Academic Guidebook of Doctor in Forestry Science (DFS/PSDIK) Study Program The Faculty of Forestry UGM in 2023 was successfully organized based on the Curriculum2022.

This Academic Guidebook contains explanations of academic policies, academic regulations, education systems, procedures, requirements and stages of study completion for PSDIK students both on regular and research-based pathways (*by research*). By referring to the standards, procedures, and stages described in the Academic Guidebook, students are expected to be able to prepare their study plans earlier so that they are expected to complete their studies on time.

For matters related to the implementation of PSDIK education that are not listed in the 2023 Academic Handbook, its implementation refers to higher policies and regulations, both at the Faculty of Forestry and Gadjah Mada University levels. This academic guidebook will continue to be improved and revised based on developments and input from interested parties.

Yogyakarta, August 2023
Dean,

Sigit Sunarta, S.Hut., MP, M.Sc., Ph.D., IPU. NIP.
19710728 199903 1 001

TABLE OF CONTENTS

FOREWORD	iii
TABLE OF CONTENTS	iv
CHAPTER I EDUCATION SYSTEM	1
1.1 Introduction.....	1
1.2 Vision, Mission and Goals of PSDIK.....	2
1.3 Graduate Learning Outcomes	3
1.4 Learning Programs and Methods	4
1.5 Semester Credit System	6
1.6 Study Plan	7
1.7 Study Assessment Mechanism.....	8
1.8 Study Evaluation	13
CHAPTER II EDUCATION GOVERNANCE.....	15
2.1 Student Registration.....	15
2.2 Student Rights and Obligations.....	20
2.3 Academic Administration	21
2.4 Lecture Period	23
2.5 Dissertation Research Period	25
2.6 <i>Soft Skills</i> Enhancement Activities and Community Service.....	26
2.7 Learning Monitoring	27
2.8 Graduation Period.....	27

CHAPTER III IMPLEMENTING ORGANIZATION OF EDUCATIONAL ACTIVITIES	31
3.1 Study Program Manager.....	31
3.2 PSDIK Teaching Staff	32
3.3 PSDIK Administrative Staff	38
3.4. Laboratory	38
3.5. Library	42
3.6. Lecture Hlls and Study Rooms	43
3.7. Information Communication Technology	43
3.8. Other Supporting Facilities	44
 APPENDIX	 45

LIST OF TABLES

1.1	Total credits that must be taken by students	5
1.2	Reference to the distribution of credit load for each semester in PSDIK	8
1.3	Example of Calculation of IP Value Per Semester.....	10
3.1	Teaching Staff of the Doctor of Science Study Program Forestry.....	33
3.2	Administrative Staff of the Doctor of Science Study Program Forestry.....	38
Attachment		
1.A.	Compulsory Courses	47
1.B.	Elective Courses in Forest Management thrust	49
1.C.	Elective Courses of Silviculture thrust	50
1.D.	Elective Courses of Forest Technology Thrust	53
1.E.	Elective Courses Conservation of Forest Resources thrust	55

CHAPTER I

EDUCATION SYSTEM

1.1 Introduction

In the context of sustainable forest management, educated and professional human resources are needed. master the scientific principles of forestry, both in their roles as academics, practitioners, and policy makers in the forestry sector. In order to meet these needs, the Faculty of Forestry Universitas Gadjah Mada organizes postgraduate level education (master and doctoral) which will produce professional and qualified human resources in the field of forestry science.

The Forestry Science Doctoral Study Program was first established in 1980 under the name of the UGM Forestry Science Postgraduate Program (PSIK), combined with the Forestry Science Master Program, under the Coordination of the UGM Graduate School. In 2006, PSIK - which is a monodisciplinary education program - began to be organized by the Faculty of Forestry UGM, and starting in 2011 the management of PSIK was distinguished in its implementation into the Master of Forestry Science Study Program (PSMIK) and the Forestry Science Doctoral Study Program (PSDIK). PSDIK in organizing its educational process is guided by the UGM Rector Regulation No. 11 of 2016 concerning Postgraduate Education and other applicable regulations.

Since 2020, in addition to organizing activities PSDIK also organizes a research-based education pathway (*by research*). This research-based pathway is organized by referring to the UGM Chancellor Decree Number 18 of 2019 concerning the Implementation of *Research-Based* Postgraduate Programs (*by Research*) at Universitas Gadjah Mada. In addition, in 2022, based on the UGM Chancellor's Decree Number 971/UN1.P/KPT/HUKOR/2022, the PSDIK manager applies the *Outcome-based Education (OBE)* curriculum as a replacement for the 2017 curriculum. For this reason, this academic guidebook was prepared in order to

assist students in planning and carrying out their studies in accordance with the new academic policies.

1.1 Vision, Mission and Goals of PSDIK

Vision

The vision of PSDIK is "to become a doctoral education program (S3) in the field of tropical forestry that is superior at the national level and internationally recognized, imbued with Pancasila and dedicated to the interests of the nation and humanity".

Mission

The mission of PSDIK UGM is all activities to achieve the vision that has been defined above. The mission of the Center is "to organize excellent and innovative doctoral education (S3) activities for the advancement of science, knowledge and technology in the field of tropical forestry and community service through research that supports sustainable forestry and environmental development".

Purpose

Based on the vision and mission above, then The goal (PEO, *Program Educational Objectives*) of the implementation of PSDIK is to produce graduates who are characterized as follows:

- a. A lifelong learner in the field of tropical forestry with high quality, morality and integrity.
- b. Able to master and develop tropical forestry science in a sustainable and environmentally sound manner.
- c. Able to lead and manage organizations in producing superior and innovative research and community service products through collaborative networks in response to forestry and environmental developments.

1.2 Graduate Learning Outcomes

The Learning Outcomes of Graduates (PLO/LOs) of the Forestry Science Doctoral Study Program according to the 2022 Curriculum are as follows:

Attitude

1. Able to be honest, disciplined, and responsible in the development of tropical forestry science, knowledge and technology based on religious, moral, ethical, legal and human values.
2. Able to contribute and cooperate for the advancement of civilization and environmental sustainability in a critical and innovative manner.

Knowledge

1. Mastering the concepts, theories, methods and philosophies of tropical forestry science systematically obtained through reasoning in the learning process, research and community service.
2. Able to find appropriate solutions to the latest tropical forestry problems based on forestry science

General Skills

1. Able to lead, develop organizational resources, and collaborate in designing, implementing, and managing data and information on research results that are beneficial to the benefit of society based on creative, innovative and comprehensive scientific methodologies in the form of dissertations and scientific papers that are accepted and or published in reputable journals.
2. Able to communicate their research, receive opinions, and convey arguments with analytical acumen through interdisciplinary, multidisciplinary or transdisciplinary approaches with national and international languages.

Special skills

1. Able to develop and apply science, knowledge and technology in the field of management, silviculture, product utilization technology and forest conservation that supports the sustainability of tropical forest ecosystems.

1.3 Programs of Learning and Methods

PSDIK organizes two learning programs, namely **regular** and **research-based** (*by research*) programs which can be completed by students within 3 years (six semesters). Each PSDIK student can choose the specialization of the field of study, which consists of 4 interests: Forest Management, Silviculture, Forest Resource Conservation, and Forest Product Technology. To complete the study, students in both pathways need to complete 46 semester credit units (credits) with the structure as presented in Table 1.1.

The courses that must be taken consist of UGM Postgraduate compulsory courses, Study Program compulsory courses, and elective courses. Postgraduate Compulsory Courses and Study Program Compulsory Courses contain a collection of theoretical courses and dissertation research which are intended to fulfill the minimum requirements of the specified PLOs. Elective courses are intended to further support students in completing their dissertation research well. As a requirement for graduation, students who take the regular program are obliged to publish 1 result of their dissertation research in reputable international journals or 2 nationally accredited journals, while students on the *by research* program are required to publish research results in 2 reputable international journals.

Table 1.1 Total credits that students must take

No.	Curriculum Framework	JR* (credits)	JbR* (credits)	Course Details (credits)
1	Postgraduate compulsory	4	4	Philosophy of Forestry Science (2) Research Methods (2)
2	Mandatory PSDIK	2	2	Sustainable Development of Tropical Forest
3	Dissertation	30	38	Proposal seminar (1) Proposal (4) Comprehensive Exam (2) Results Seminar 1-3 (3) Publication 1 (8) Publication 2** (8) Dissertation manuscript (8) Dissertation Examination (4)
4	Choice of Interests	10	2	Interests (MH or Sil or KSDH or THH or free choice cross-disciplinary)***
5	Total	46	46	number of credits for requirements to become a Doctor at PSDIK

Notes: *JR = Regular program, JbR = *by Research* program, ** only for *by Research* program, ***MH (Forest Management), Sil (Silviculture), KSDH (Forest Resources Conservation), THH (Forest Products Technology)

The learning methods offered by PSDIK are provided through organizing class meetings either offline (full face-to-face), online (*full online*), or mixed (partly offline, partly online), while practical class is organized in the form of physical activities in the laboratory or field and other tasks such as making reports. PSDIK managers and lecturers will facilitate the interests and limitations of student conditions in organizing classes as best as possible without reducing the quality of learning.

In general, learning is held on a scheduled basis from Monday-Friday in **Regular Classes**, but for students -both independently and in collaboration schemes- who only get a study permit from their home institution (still working on weekdays), PSDIK will facilitate the implementation of learning with the **Intensive Class** method. With this Intensive Class, students will take compulsory and elective courses on Friday and Saturday.

1.4 Semester Credit System

The learning system at PSDIK adheres to the Semester Credit System (SKS). Semester is a unit of activity time composed of 14 to 16 weeks of lectures or other scheduled activities, including 2 to 3 weeks of assessment activities. SKS is an education delivery system that uses semester credit units (credits) to express student study load, lecturer workload, learning experience, and program implementation load. One credit lecture is an educational activity of 3 hours every week for 1 semester which consists of: 1 hour of face-to-face activities with lecturers in scheduled lectures, 1 hour of structured academic activities planned by lecturers but not scheduled, and 1 hour of independent learning activities by students. One credit for laboratory practice is an educational activity of 4-5 hours every week consisting of 2-3 hours of physical activities in the laboratory, 1 hour of activity series such as writing reports, and 1 hour of independent activities. The preparation, planning and implementation of educational programs use credits as a measure of student academic load.

1.5 Study Plan

The study load for PSDIK students to complete their studies is 46 credits which can be completed in 6 semesters (3 years). Students from both pathways (Regular and *by Research*) are required to complete 3 compulsory courses with a total of 6 credits, including: MK. Philosophy of Forestry Science (2 credits), MK. Research Methods (2 credits), and MK. Tropical Forests and Sustainable Development (2 credits). Furthermore, to complete the

fulfillment of the study load, regular track students will take elective courses of at least 10 credits and dissertation research of 30 credits, while students on the *by Research* track will take elective courses of 2 credits and dissertation research of 38 credits. The reference for the distribution of study load per semester is presented in Table 1.2. Elective courses taken can be selected from courses offered at PSDIK, PSMIK and other Faculties within and outside UGM, and can be determined with the Manager/Promotor Team by considering the student's educational background and the topic of dissertation research to be carried out.

Table 1.2 Reference to the distribution of credit load for each semester at PSDIK

Sem.	Regular (JR)		by Research (JbR)	
	credits	MK	credits	MK
1	8	MK. Postgraduate Compulsory	8	MK. Postgraduate Compulsory
		Mandatory Study Program		Mandatory Study Program
		Elective modules		Elective modules
2 - 3	8	MK. Elective Interests	7	Proposal seminar
				Proposal
				Comprehensive Examination
	7	Proposal Seminar	9	Results Seminar 1
				Proposal
				Publication 1
4	9	Results Seminar 1	9	Result Seminar 2
		Publications		Publication 2
5	9	Result Seminar 2	8	Dissertation manuscript
		Dissertation manuscript		
6	5	Result Seminar 3	5	Result Seminar 3
		Dissertation defense		Dissertation defense
Total credits	46		46	

1.6 Study Assessment Mechanism

Study assessment is carried out on learning activities which include the lecture process and dissertation research components (preparation of dissertation proposals; comprehensive examinations, presentation of research results; preparation of scientific articles for publication,

preparation of dissertations and dissertation examinations) and is expressed in the Achievement Index (IP).

Calculation of Achievement Index (IP)

Student achievement in learning is expressed in the Achievement Index (IP), and is calculated through the weighting of grades letter values into numerical numbers (according to UGM Rector Regulation No.2 of 2023) as follows:

A	Weight value 4.00
A-	Weight value 3.75
A/B	Weight value 3.50
B+	Weight value 3.25
B	Weight value 3.00
B-	Weight value 2.75
B/C	Weight value 2.50
C+	Weight value 2.25
C	Weight value 2.00
C-	Weight value 1.75
C/D	Weight value 1.50
D+	Weight value 1.25
D	Weight value 1.00
E	Weight value 0.00

The calculation of the achievement index (IP) is done with the following formula:

$$IP = \frac{\text{(Sum of the product of SKS weight with the weight value of each course/practice)}}{\text{(Total credits of all courses/practicum)}}$$

Example: A student takes 5 (five) courses/learnings with the respective results as presented in Table 1.3.

Table 1.3 Example of Calculation of IP Value Per Semester

No.	Course Content	Credit weight	Value (N)		K*N
			Letter	Weight	
1	Elective 1	2	A	4,00	8,00
2	Elective 2	2	B+	3,25	6,50
3	Elective 3	2	A/B	3,50	7,00
4	Proposal	4	A-	3,75	15,00
5	Proposal Seminar	1	A	4,00	4,00
	Total	11			40,50

Achievement Index (IP) = $40.50/11 = 3.68$

Achievement Index consists of Semester Achievement Index (IPS) and Cumulative Achievement Index (GPA). IPS is the IP in the semester taken while GPA is the IP of all courses / learning activities that have been taken.

Lecture Assessment

The learning outcomes of each course are assessed using several methods such as written exams, oral exams, presentations/seminars, writing scientific papers (papers), quizzes or a combination of these methods. Written exams can be conducted in the middle of the semester and or the end of the semester, according to the Semester Learning Program and Activities Plan (RPKPS) document for each course. Assessment is intended to measure the level of student understanding of course material and group students based on their level of understanding of course material. Assessment of learning activities uses an absolute assessment system.

The grade of learning outcomes is based on the UGM Chancellor Regulation No. 2/2023 which is expressed using the letters A, A-, A/B, B+, B, B-, B/C, C+, C, C-, C/D, D+, D, and E. If students withdraw from learning activities illegally (do not report) until the deadline for changing KRS and are still listed in the list of participants in lectures or learning activities, then at the end of the semester students are given the grade of T (incomplete) is given to students who do not

completely fulfill the elements of the assessment criteria or have not completed all assignments. If within one month the student is unable to complete the deficiency, then the grade of T is changed to E.

Assessment of Research Proposal / Result Seminar

The learning stage in the form of a proposal seminar is carried out by students after the draft proposal is approved by the Promoter Team, while the research results seminar is conducted when the progress of the research results has been deemed complete and feasible by the Promoter Team to be presented in a seminar. The Proposal Seminar and Research Result Seminar are attended by the Promoter Team and doctoral students across generations. Assessment is given by the Promoter Team on the student's performance in presenting the research plan / results as well as the student's mastery of the material of the research plan / results shown during the discussion and in answering questions asked by the Promoter Team and peer students. Grades for the Proposal Seminar and Research Result Seminar follow the assessment provisions as described in the study assessment mechanism section.

Proposal/Dissertation Manuscript Assessment

The proposal script is assessed by the Promoter Team and the Comprehensive Examination Team after revision based on the input received during the proposal seminar. The assessment of the proposal is given based on the urgency of the problem to be answered through research, clarity and sophistication of research methods to answer the problem, sophistication of references, and the orderliness of language and writing.

Assessment of the dissertation manuscript is given by the Promoter Team and the Dissertation Assessment Team on the final dissertation manuscript draft. The final dissertation draft is a revised draft based on the review of the Dissertation Assessment Team and input from the Promotor

Team that is ready to be submitted for the Closed Examination process. The dissertation manuscript draft is assessed on the urgency of the problems that are answered through research, the accuracy and sophistication of research methods in answering problems, the novelty (*research findings*) raised, the sophistication of references, and the conciseness of language and writing. Grades for proposal drafts and dissertation drafts follow the assessment provisions as explained in the study assessment mechanism section.

Comprehensive Examination/Dissertation Assessment

The learning stage in the form of a comprehensive examination is carried out by students after the final dissertation proposal is approved by the Promoter Team. The comprehensive examination is conducted to assess the level of mastery of the scientific material taken, both general (basic) and specific related to the research topic, reasoning ability in raising research problems, ability to analyze problems in the form of research approaches, and mastery of research methods to answer research problems. The comprehensive examination assessment is carried out by the Promoter Team and 3 (three) examiners who are selected based on the relevance of the scientific field to the dissertation topic.

The dissertation closed examination is conducted after the final draft of the dissertation has been approved by the Assessment Team and the Promoter Team. Assessment in the closed examination is carried out related to research material, research methods, strength of reasoning in discussion and conclusions, writing style and consistency of description, as well as appearance in terms of mastery of general material and theory, and mastery of methodology and argumentation. The assessment of the dissertation closed examination is carried out by the Promoter Team, Assessment Team, and 2 examiners who are selected based on the relevance of the scientific field to the dissertation topic. Grades for comprehensive exams and dissertation closed exams follow the assessment provisions as previously described. If the student gets a grade of less than 3.25 (B+), then the student is considered not passing and can repeat the exam after a certain time.

1.7 Study Evaluation

Evaluation of the learning process of PSDIK students is generally carried out in various forms of assessment through semester exams; proposal seminars; comprehensive examinations; monitoring of study progress; results seminars, publications, dissertation feasibility assessments; and dissertation examinations. Monitoring and evaluation activities of the PSDIK student learning process are based on the achievement of student academic achievement which is carried out in two stages, namely a) Initial learning evaluation and b) Final learning evaluation.

The initial learning evaluation of PSDIK students is carried out based on the following provisions:

- a. If the student has not passed the comprehensive examination by the end of semester 3, he/she will be given a maximum of 1 semester to complete (pass) the comprehensive examination.
- b. If there is no progress until 1 additional semester, then students are not allowed to continue their studies and are declared to have resigned or *dropped out*, unless students have strong reasons for obstruction, which are submitted in a statement letter.

The final evaluation of PSDIK students is carried out based on the following provisions:

- a. If until the end of semester 6 students have not completed all learning activities with a minimum GPA of 3.25 and do not have publications in international journals, students receive a First Warning Letter (SP 1).
- b. If until the end of semester 7 students have not completed all learning activities with a minimum GPA of 3.25 and do not have publications in international journals, students receive a Second Warning Letter (SP 2).
- c. If until the end of semester 8 students have not completed all learning activities with a minimum GPA of 3.25 and have not had publications in international

journals or 2 international proceedings or 2 national journals accredited by SINTA 1 or 2, then students get an extension of 2 semesters, before then getting a Third Warning Letter (SP3).

- d. If a student has received an SP3, then the student is not allowed to continue their studies and is declared to have resigned or *dropped out*, unless the student has a strong reason for obstruction, which is submitted in a statement letter.

Students who have completed the number of credits in accordance with the requirements are declared graduates if they meet the requirements, namely: GPA of at least 3.25; no grade D or E; has had 1 manuscript that has been accepted in an international journal (or 2 manuscripts in international proceedings, or 2 manuscripts published in SINTA 1-2 accredited national journals) for regular track students, while for students *by Research* has had 2 manuscripts that have been accepted in reputable international journals; has passed the Dissertation Examination; has submitted a dissertation manuscript authorized by the Dean, and passed the PSDIK judicium meeting.

Students who are declared to have passed the Doctoral program receive the following graduation predicate:

- a. Cumlaude (graduation predicate with praise); if $GPA > 3.75$ and study period ≤ 8 semesters
- b. Very satisfactory (high graduation predicate); if $3.51 \leq GPA \leq 3.75$ or $GPA > 3.75$ with a study period > 8 semesters
- c. Satisfactory (moderate graduation predicate); if $3.25 \leq GPA \leq 3.50$.

CHAPTER II

EDUCATION ADMINISTRATION

2.1 Student Registration

a. New Student Registration

Registration Requirements

Calon students of the Forestry Science Doctoral Study Program can register *online* through the www.um.ugm.ac.id page by completing the requirements that are subsequently uploaded online as follows:

1. Master's degree or equivalent from an accredited study program in the field of science that is appropriate and / or related to the Doctoral program to be followed. Master's diploma, or a legalized copy of the diploma.
 - Graduation Certificate (SKL) is not valid.
 - Overseas applicants must have a diploma equalization document from DIKTI.
2. Original transcripts of grades, with a master's GPA as follows:
 - ≥ 3.00 on a scale of 4 or equivalent, for applicants who are graduates of A accredited study programs, or;
 - ≥ 3.25 on a scale of 4 or equivalent, for applicants who graduated from an accredited study program B, or;
 - ≥ 3.50 on a scale of 4 or equivalent, for applicants who are graduates of C accredited study programs.
3. Certificate of accreditation of the study program at the last level of education. Accreditation of study programs referred to is the current accreditation and is proofed by a scan of the accreditation certificate or print screen of accreditation from the BAN-PT website that is still valid.

Study programs whose accreditation is in the process of being extended, evidenced by a receipt of submission of accreditation forms to DIKTI. For applicants with overseas graduates, proof of accreditation is the Decree of Equalization of Overseas Diplomas from DIKTI. If the Accreditation document is not valid, it will not be processed further.

4. Certificate of results of the BAPPENAS Academic Potential Test (TPA) or UGM Postgraduate Academic Potential Test (PAPs) with a minimum score of 500, proven by a valid certificate, which is a maximum of 2 years from the date of issuance of the certificate.
5. The certificate of English proficiency test results is proven by a valid certificate, which is a maximum of 2 years from the date of issuance of the certificate. Recognized English proficiency certificates and minimum scores are (choose one):
 - Academic English Proficiency Test (AcEPT) with a minimum score of 209;
 - International English Testing System (IELTS) from an institution recognized by IDP with a minimum score of 5.0;
 - Test of English as a Foreign Language (TOEFL) Internet Based Test (iBT) from an institution recognized by IIEF with a minimum score of 45;
 - Test of English as a Foreign Language (TOEFL) Institutional Testing Program (ITP) TOEFL from an institution recognized by IIEF with a minimum score of 450;
 - Test of English Proficiency (TOEP) from the Indonesian Test Service Center (PLTI) recognized by DIKTI for Lecturer certification with a minimum score of 450 (45)

Enrollment Procedure

1. Create a registration account on the page www.um.ugm.ac.id
2. Register online
 - a. Prepare all required documents. Subsequent documents after submitting the registration will not be processed.
 - b. Prepare scans of the following documents (minimum size 150KB and maximum 800KB for each file; scanned documents must be in color and clearly legible for verification purposes), and upload them when applying online.
 - Recent color photograph, dressed and posed formally (face facing camera) with blue background (*.jpg format)
 - Valid and legal diploma of the last education level (*.pdf format)
 - Valid and legal academic transcript of the last education level (all pages) (*.pdf format)
 - Certificate / proof of accreditation of the study program at the last level of education (current accreditation) (*.pdf format)
 - Certificate of valid BAPPENAS Academic Potential Test (TPA) or UGM Postgraduate Academic Potential Test (PAPs) (*.pdf format)
 - A valid certificate of English proficiency (*.pdf format). Recognized certificates are: Academic English Proficiency Test (AcEPT), or International English Testing System (IELTS) from an institution recognized by IDP, or Internet-Based (iBT) TOEFL from an institution recognized by IIEF, or Institutional Testing Program (ITP) TOEFL from an institution recognized by IIEF, or Test of

English Proficiency (TOEP) from the Indonesian Test Service Center (PLTI) which is recognized by DIKTI for lecturer certification.

- Recommendations from 2 (two) people who know prospective students at the previous education level, Academic Supervisors and / or other people who are considered authorized, for example the supervisor of the prospective student's workplace.
 - Health certificate, drug-free, and special health certificate required for prospective students of the Study Program from a doctor at the health clinics or hospital (format *.pdf).
 - Projected desires of prospective students that contain:
 - Proposed research design in the form of a dissertation proposal draft (dissertation proposal draft does not need to be uploaded but directly sent / submitted to the destination study program accompanied by a photocopy of proof of registration);
 - Lecturers who have been contacted regarding the proposed research design if any; and
 - Reasons and expectations for joining the selected program.
 - Scientific works that have been published by prospective students if any (*.pdf format).
 - Study permit and/or study assignment from the institution where you work, for prospective students who are already working (format*.pdf)
- c. Pay the registration fee through the multi-payment system of Bank Mandiri, BNI, BRI, Bank Syariah Mandiri (BSM), or BTN.

- d. Printing Proof of Registration. Proof of Registration is used for registration purposes if declared accepted as a prospective graduate program student.

Prospective Doctoral Program students who wish to obtain BPI scholarships are advised to first register online through www.studi.dikti.go.id and then register to the registration page www.um.ugm.ac.id according to the specified schedule.

Registration Time

Applicant registration can be done in the odd semester and even semester. The registration time is determined according to the schedule set by the Directorate of Education and Teaching of Universitas Gadjah Mada, which can be accessed through the website www.um.ugm.ac.id.

Substance test

Prospective students who apply to PSDIK will go through a substance test in the form of an interview regarding the dissertation research plan in front of a team formed by PSDIK. For this process, students need to prepare an initial dissertation research proposal document and make a presentation for 10 minutes followed by questions and answers with a team of substance examiners for 20 minutes.

b. (Re-)enrollment of on-going students

1. Every UGM student is required to re-register (administrative and academic) at the beginning of each semester whose schedule is set by the University according to the academic calendar. Students who will re-register are required to fulfill the following conditions:
 - a. Paying education fees
 - b. Submit receipts for payment of SPP and other fees for the semester concerned to the Academic Section of the Study Program.

2. Students who are interrupted in their studies (inactive without permission) must submit a Return to Active Permit to the Dean by first paying the full SPP during the inactive period.
3. Students who are on leave in the previous semester, must submit a Return to Active Permit to the Dean.
4. Students who are late for re-registration must obtain special permission to be late in advance from the Dean or those authorized to do so to re-register.

2.2 Student Rights and Obligations

The rights and obligations of PSDIK students are attached to those concerned after completing administration in accordance with applicable regulations and being declared valid as PSDIK students. Rights and obligations will be canceled when the person concerned no longer has status as a PSDIK student.

Student rights

1. Get education and teaching that meets the academic standards that apply in PSDIK.
2. Use existing and available academic facilities while still guided by applicable regulations.
3. Receive recognition for academic achievements obtained for the benefit of on and off campus as general provisions.
4. Get protection for the freedom of academic pulpit that is carried out, which is in accordance with the academic ethics that apply at UGM.
5. Receive professional and proportional services from PSDIK.
6. Under certain conditions, students have the right to replace members of the promoter team (according to the procedures set by the study program).

Student Obligations

1. Bear the cost of education and other costs regulated by the Faculty and / or university, except for students who are on study leave with Dean's permission or students on full scholarship.
2. Maintain order, calmness and discipline to support the realization of a conducive atmosphere for learning activities.
3. Behave politely, responsibly and have high ethics in maintaining the good name of the faculty and university alma mater.
4. Participate in fostering an academic culture in relationships on campus and off campus so as to realize PSDIK as one of the sources of education and culture.
5. Improve intellectual abilities in various branches of science and technology, academic, social, and creative abilities to improve their quality so as to provide security to those who need their energy and expertise.
6. Comply with and obey all applicable regulations in the study program, faculty, and university.
7. Continue to maintain and honor the name of UGM after completing your studies and devoting yourself to society.

Student Semester Leave

1. During their studies, students are allowed to take leave for a maximum of 2 semesters, which can be taken separately or directly consecutively,
2. Leave can be taken if the student has passed the comprehensive examination,
3. Students who plan to take leave must submit a leave application to the Dean with the knowledge of their promoter within the time period determined by the UGM Directorate of Education and Teaching (DPP) (at the beginning of the semester concerned).

2.3 Academic Administration

Academic administration is a routine activity that supports the planning, implementation, organization and evaluation of education implementation. In semester academic administration, students get assistance / facilities / information regarding, among others:

- a. **Academic calendar** - contains lecture activities, other academic activities and time limits for each activity in the semester. For regular programs, the odd semester starts at the beginning of August until the end of January, and for the even semester starts at the beginning of February until the end of July. The academic calendar for programs outside the regular program is arranged in accordance with the agreement.
- b. **Courses offered** - Lists the name, nature, prerequisites (if any), credit weight, and instructor of the courses offered in the semester according to the level.
- c. **KRS- filling** is done online according to predetermined procedures. KRS filling time is regulated by PSDIK and announced to students in advance. To fill in KRS, students must prove to be active in that semester and have paid UKT. KRS filling is authorized by Kaprodi / Academic Supervisor (Promoter) respectively. Students who are late filling in KRS need to submit a late application to the Study Program Manager / Dean.
- d. **Monitoring and Evaluation of learning** - carried out every 3 months by the PSDIK Manager for all students in each batch (semester).
- e. **Monitoring of Study Progress** - conducted every 6 months by the Promoter Team which can be done in the form of a results seminar in a limited forum.

In addition to routine semester activities, academic administration also facilitates students in terms of:

- a. Promoter team submission, Assessment team submission and Examiner team- Submission procedures and forms for the submission process are available online and can be accessed from the Secretariat or the PSDIK *website* (www.dik.fkt.ugm.ac.id)
- b. Submission of proposal seminars, results seminars, comprehensive examinations, and closed examinations- Submission procedures and forms for the submission process are available online and can be accessed from the Secretariat or the PSDIK *website*.
- c. Submission of open examinations - Open examinations are held by PSDIK based on the agreement of the Examination Team in the closed examination as a form of appreciation of student dissertation research material. Submission procedures and forms for the open exam submission process are available online and can be accessed from the Secretariat or the PSDIK *website*.

2.4 Lecture Period

Matriculation

Matriculation must be followed by new students from non-forestry undergraduate and postgraduate degrees, or forestry undergraduate but non-forestry postgraduate degrees. For new students from non-forestry S1 and S2, matriculation is carried out by taking 5 courses consisting of:

1. Course of thrust- Tropical Forest Management
2. Courses of thrust - Tropical Forest Silviculture
3. Courses of thrust - Tropical Forest Products Technology
4. Courses of thrust - Conservation of Tropical Forest Resources
5. Elective courses of student interest related to the dissertation research plan. It is taken based on the advice of the PSDIK Manager and or Promoter.

For new students with a forestry undergraduate background but a non-forestry master's degree, matriculation is carried out by taking 1 course of interested thrust and 1 elective course in

accordance with the field of their research plan based on the advice of the PSDIK Manager and /or Promotor.

Lecture Activity

Lecture activities are carried out according to the academic calendar which can be accessed through the PSDIK *website* (www.dik.fkt.ugm.ac.id), which is usually held at the end of August or early September for odd semester and February for even semester.

Courses that can be taken in the current semester have been previously submitted to students through their respective SIMASTER accounts. Students register for courses of interest by obtaining approval from the PSDIK Manager or from the Promoter (if the Promoter Team has been formed and authorized).

Lectures are generally held directly (face-to-face in class/offline), but since the pandemic, PSDIK has facilitated offline and *online* meetings according to the agreement between the lecturer and students. In the implementation of lectures, assessment of competency achievement is carried out in various ways including quizzes, paper writing assignments, presentations, discussions, midterm exams, semester final exams and other forms that may exist. The assessment weight of these forms of assessment is conveyed by the lecturer at the beginning of the lecture to be agreed with the students.

Exam and Result Announcement

The mid-semester exam is held in the 8th week of each semester and the final semester exam is held in the 16th week of each semester. The exam can be given in the form of a written test or in the form of an exam substitute assignment with the processing period as determined by the lecturer. The announcement of the final grade of the exam results will be carried out no later than 4 weeks after the final exam, which is submitted online through SIMASTER for each student. Determination of course grades is the academic authority of the lecturer in charge of the course.

2.5 Dissertation Research Period

The implementation of dissertation research can begin at the same time as taking theoretical courses or afterwards. In its implementation, students will conduct dissertation research activities (30 credits for regular track students and 38 credits for *by research* track students) through taking its component courses (proposal seminar, proposal, comprehensive examination, results seminar, publication, dissertation manuscript, and closed examination). Each research component has its own credit value (see Table 1.1). Taking research component courses is done like taking theory courses, by registering in their respective SIMASTER accounts to get promoter approval, for research components that are expected to be completed in the current semester. If at the end of the semester the research component cannot be completed, then students will retake the component in the following semester. The taking of dissertation research component courses for PSDIK students is explained as follows:

1. The Proposal Seminar course (1 cr) is conducted when the promoter team has approved the draft dissertation research proposal prepared by the student. The implementation of the proposal seminar can be done in semester 1 (for students by research and in semester 2 for regular students, without having to wait for the value of all theoretical courses. This seminar is conducted openly led by the promoter and attended by the promoter team and students across generations.
2. The Comprehensive Examination course (2 cr) is held after the Promoter Team approves the revised proposal as a result of input in the proposal seminar.
3. The Proposal course (4 cr) is taken (submitted for assessment) together with the comprehensive examination.
4. The Result Seminar course (1 cr) must be conducted 3 times by regular track students since passing the comprehensive examination. For *by research* students, the result seminar must be conducted every

semester but which will be submitted in KRS (to get an assessment) as many as 3 results seminars. The timing of the results seminar is decided with the Promoter Team, and can be carried out in conjunction with the monitoring and evaluation process of study progress. The results seminar is held in the presence of the Promoter Team, students across generations and representatives of the Study Program Manager.

5. Publication courses (8 cr) must be completed by publishing research results in reputable international journals as many as 2 publications *by research* students, while for regular track students publications in reputable international journals are at least 1 and can be replaced by 2 publications in SINTA accredited national journals 1 or 2. Publications must be completed before the implementation of the dissertation examination (closed). The assessment is carried out by the Promoter Team and the Assessment Team along with the dissertation assessment.
6. The Dissertation Examination course (4 cr) is carried out after the Promoter Team and the Assessment Team approve the revision of the student's dissertation draft. The dissertation defense grade is given at the end of the closed examination by a team of examiners consisting of the promoter team, the assessment team and 2 additional examiners.
7. The Dissertation Manuscript course (8 cr) is taken by students together with the submission of the Closed Examination (4 cr). Assessment is carried out by the Promoter Team and the Assessment Team on the final draft (revision) of the dissertation based on the input of the Assessment Team.

2.6 Soft Skills and Community Service Improvement Activities

To improve the soft-skills ability of PSDIK students in conducting research and writing scientific articles, the PSDIK

manager every semester organizes *soft-skills* workshops for students.

The workshop material includes the preparation of scientific article drafts according to the intended journal, *journal referencing* techniques, *systematic literature review* techniques, writing *rebuttal letters*, and other themes needed by students in completing their studies.

Community Service activities are one of the activities that must be followed by all PSDIK students. Every year in the middle of the odd semester, the PSDIK manager organizes community service activities that must be attended by 2nd and 3rd semester students. Community service activities are carried out in the target village that has been determined by the study program manager.

2.7 Monitoring Learning

Monitoring and evaluation (monev) of student learning outcomes, especially in the implementation of dissertation research, is carried out in 2 ways. The first way is through the monev process carried out by the promoter team at the end of each semester. At this monev event, students will make presentations related to the progress of the implementation of their research components and the promoter team will make a study progress report to be submitted to the study program manager. Monev at the end of the semester can be carried out in the form of a student results seminar.

The second method is monitoring and evaluation every 3 months conducted by the study program manager. This M&E is carried out on all students together for each batch. This monitoring activity is intended to monitor the progress of dissertation research implementation, anticipate problems that may exist and find solutions to any problems encountered by students, and expedite the completion of studies.

2.8 Graduation Period

Dissertation Closed Examination

The dissertation closed examination must be attended

by PSDIK students if the student's GPA has met the minimum requirements (minimum GPA of 3.25, has had publications according to the rules, has met the requirements for English and PAPs according to the requirements for new student registration, the dissertation draft has been approved by the Assessment Team and the Promoter Team). The closed examination is chaired by the Dean / Professor / other representative officials who are not the promoter team, and must be attended by at least one external examiner. The results of the assessment of the dissertation closed examination are expressed in numerical scores (0-4) with a decision to pass without improvement or with improvement (average score ≥ 3.25), and not pass (average score < 3.25). If a student is declared not to have passed the dissertation closed examination, they can repeat the examination a maximum of 1 time at least 3 months and a maximum of 1 year after the first closed examination.

Open Examination (Doctoral Promotion)

Students who pass the closed examination can be proposed to take graduation or open examination. The open examination is intended only for students who have a GPA and dissertation closed examination score > 3.75 . The open examination is a form of appreciation for outstanding dissertations for scientific and institutional development and is decided with the consideration of the examination team. The determination of the implementation of the open examination is further determined by the Head of the Study Program.

Graduation

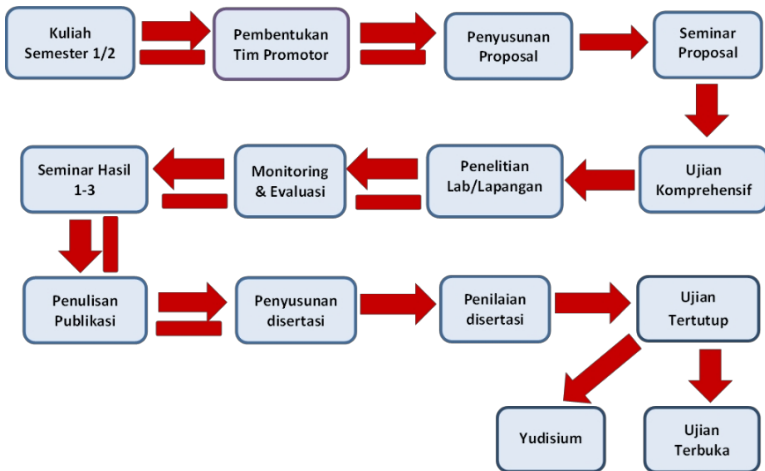
Students who have completed the number of credits in accordance with the requirements of the Study Program Curriculum are declared to have passed the Doctoral Program if:

- a. Meet the following requirements:
 - A minimum cumulative grade point average of 3.25;
 - No D or E grades;
 - Has passed the dissertation defense;
 - Have submitted a final dissertation manuscript that

has been authorized by the Dean;

- Have at least 1 scientific publication / manuscript that has been accepted by a scopus indexed international journal publisher or 2 manuscripts/publications in SINTA 1 or 2 accredited national journals for regular track students, and have had at least 2 publications in Scopus indexed international journals for *by research* track students.
 - Have met the English language proficiency and academic potential requirements.
- b. has passed the graduation meeting held by PSDIK.

In general, the sequence of PSDIK lecture activities is shown in Figure 1.1.



Description:

⇒ connects 2 sequential stages, connects 2 activities that can be done simultaneously

Figure 2.1. Order of academic activities of the Doctor in Forestry Science Study Program (DFS/PSDIK)

CHAPTER III

IMPLEMENTING ORGANIZATION of EDUCATION ACTIVITY

3.1 Study Program Manager

According to the Regulation of the Rector of Universitas Gadjah Mada Number 10 of 2020 concerning the Second Amendment to the Regulation of the Rector of Universitas Gadjah Mada Number 809/P/ SK/HT/2015 concerning the Organizational Structure and Governance of Faculties within Universitas Gadjah Mada, the management of PSDIK is under the Faculty of Forestry UGM under the responsibility of the dean. The organizational structure of the PSDIK program management is presented in Figure 3.1.

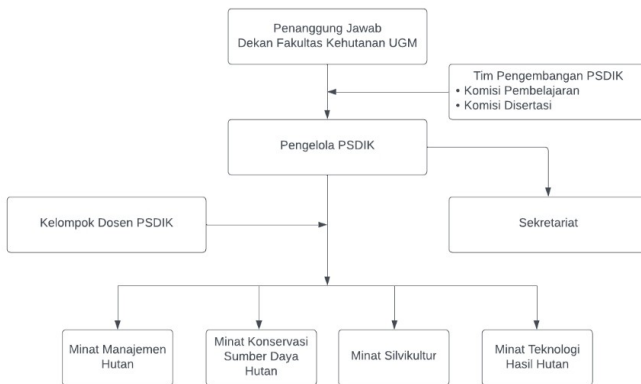


Figure 3.1 PSDIK Organizational Structure

PSDIK managers for the 2022-2026 period are as follows,

Head of Study Program : Ir. Eny Faridah, M.Sc., Ph.D.

Secretary of Study Program : Dr. Ir. Hero Marhaento, S.Hut.,
M.Si

3.2 PSDIK Teaching Staff

The teaching staff of PSDIK consists of lecturers with a minimum qualification of Doctor (S3), most of whom are teaching staff from the Faculty of Forestry UGM, and some lecturers who come from other faculties within UGM and from outside the university. The following are PSDIK teaching staff who come from the Faculty of Forestry UGM based on their functional positions and fields of knowledge:

Table 3.1 Teaching Staff of Forestry Science Doctoral Study Program

No.	Lecturer Name	Functional Position*	Department	Areas of Expertise
1	Prof. Dr. Ir. T.A. Prayitno, M.F.	Professor	THH	Wood Composites and Adhesives
2	Prof. Dr. Ir. Ganis Lukmandaru, S.Hut., M.Agr.	Professor	THH	Wood Chemistry
3	Prof. Dr. Ir. Ragil Widyorini, S.T., M.T.	Professor	THH	Composite Technology
4	Prof. Dr. Ir. Mohammad Na'iem, M.Agr.Sc.	Professor	Silviculture	Tree Breeding
5	Prof. Dr. Ir. Suryo Hardiwinoto, M.Agr.Sc.	Professor	Silviculture	Silviculture
6	Prof. Dr. Priyono Suryanto, S.Hut., M.P.	Professor	Silviculture	Agroforestry
7	Prof. Dr. Ir. Sri Rahayu, M.P.	Professor	Silviculture	Forest Pathology
8	Prof. Dr. Ir. Budiadi, S.Hut., M.Agr.Sc.	Professor	Silviculture	Agroforestry Silviculture
9	Prof. Dr. Ir. San Afri Awang, M.Sc.	Professor	MH	Social and Environmental Forestry
10	Prof. Dr. Ahmad Maryudi, S.Hut., M.For.	Professor	MH	Forestry Policy
11	Prof. Dr. Ir. Ronggo Sadono	Professor	MH	Forestry Statistics
12	Prof. Dr. Ir. Ris Hadi Purwanto, M.Agr.Sc	Professor	MH	Forest Planning
13	Prof. Dr. Ir. Emy Poedjirahajoe, M.P.	Professor	KSDH	Forest Ecology

Table 3.1 Teaching Staff of Forestry Science Doctoral Study Program (continued)

No.	Lecturer Name	Functional Position*	Department	Areas of Expertise
14	Prof. Dr. Ir. Satyawan Pudyatmoko, S.Hut. M.Sc.Forest.Trop	Professor	KSDH	Wildlife Management
15	Dr. Ir. Lies Rahayu Wijayanti Faida, M.P.	Associate Prof.	KSDH	Nature Preservation
16	Dr. Ir. Ambar Kusumandari, M.ES.	Associate Prof.	KSDH	Soil and Water Conservation
17	Dr.rer.nat. Ir. Sena Adi Subrata, S.Hut., M.Sc.	Associate Prof.	KSDH	Wildlife Ecology
18	Dr. Ir. Hero Marhaento, S.Hut., M.Si.	Associate Prof.	KSDH	Watershed Management
19	Dr. Ir. Senawi, M.P.	Associate Prof.	MH	Forestry Mapping and Remote Sensing
20	Dr. Ir. Spto Indrioko, S.Hut., M.P.	Associate Prof.	Silviculture	Tree Breeding
21	Dr. Ir. Musyafa', M.Sc.	Associate Prof.	Silviculture	Forest Entomology
22	Dr. Ir. Eny Faridah, M.Sc.	Associate Prof.	Silviculture	Tree Physiology
23	Dr. Dra. Winastuti Dwi Atmanto, M.P.	Associate Prof.	Silviculture	Tree Physiology
24	Dr. Ir. Widyanto Dwi Nugroho, S.Hut., M.Sc.	Associate Prof.	THH	Wood Anatomy and Identification
25	Dr. Ir. Widiyatno, S.Hut, M.Sc.	Associate Prof.	THH	Silviculture

Table 3.1 Teaching Staff of Forestry Science Doctoral Study Program (continued)

No.	Lecturer Name	Functional Position*	Department	Areas of Expertise
26	Dr. Ir. Rini Pudjiarti, S.Hut., M.Agr.	Associate Prof.	THH	Non-Timber Forest Products
27	Dr. Ir. M. Navis Rofii, S.Hut., M.Sc.	Associate Prof.	THH	Biocomposite Technology
28	Dr. Ir. Denny Irawati, S.Hut., M.Sc.	Associate Prof.	THH	Biorefinery/Biomass Energy
29	Dr. Ir. Fanny Hidayati, S.Hut., M.Sc.	Associate Prof.	THH	Basic Properties of Wood
30	Dr. Ir. JP Gentur Sutapa, M.Sc.	Assistant Prof.	THH	Biomaterials Technology/ Biomass Energy
31	Dr. Ir. Tomy Listyanto, S.Hut., M.Env.Sc.	Assistant Prof.	THH	Wood Drying and Preservation
32	Dr. Ir. Sigit Sunarta, S.Hut., M.P., M.Sc.	Assistant Prof.	THH	Non-Timber Forest Products
33	Dr. Ir. Nunuk Supriyatno, M.Sc.	Assistant Prof.	MH	Harvesting Forest Products
34	Dr. Ir. Emma Soraya, S.Hut., M.For.	Assistant Prof.	MH	Forestry Geomatics
35	Dr. Ir. Wahyu Wardhana, S.Hut.	Assistant Prof.	MH	Forestry Geospatial Information
36	Dr. Ir. Dwiko Budi Permadi, S.Hut., M.Sc.	Assistant Prof.	MH	Regional Forestry Development Planning
37	Dr. Ir. Rohman, S.Hut., M.P.	Assistant Prof.	MH	Regulation of Forest Products

Table 3.1 Teaching Staff of Forestry Science Doctoral Study Program (continued)

No.	Lecturer Name	Functional Position*	Department	Areas of Expertise
38	Dr. Ir. Muhammad Ali Imron, S.Hut., M.Sc.	Assistant Prof.	KSDH	Wildlife Conservation
39	Dr. Ir. Taufik Tri Hermawan, S.Hut., M.Si.	Assistant Prof.	KSDH	Conservation Area Management
40	Dr. Ir. Hatma Suryatmojo, S.Hut., M.Si.	Assistant Prof.	KSDH	Forest Hydrology
41	Dr. Ir. Atus Syahbudin, S.Hut., M.Agr.	Assistant Prof.	Silviculture	Dendrology
42	Dr. Ir. Ananto Triyogo, S.Hut., M.Sc.	Assistant Prof.	Silviculture	Forest Protection
43	Dr. Ir. Yeni Widyana NR, S.Hut., M.Sc	Assistant Prof.	Silviculture	Seed Technology
44	Dr. Ir. Daryono Prehaten, S.Hut. M.Sc.	Assistant Prof.	Silviculture	Forest Soil Science
45	Dr. Ir. Handoyo Hadi Nurjanto, M.Agr.Sc.	Assistant Prof.	Silviculture	Forest Soil Science
46	Dr. Ir. Dwi Tyaningsih Adriyanti, MP.	Lecturer	Silviculture	Dendrology
47	Dr. Ir. Arom Figyantika, S.Hut., M.Sc	Lecturer	Silviculture	Forest Soil Science
48	Dr. Ir. Ari Susanti, S.Hut., M.Sc.	Lecturer	MH	Forest Resource Management System Analysis
49	Prof. (Ret) Dr. Ir. Soemardi, M.For.Sc.	Professor (retired)	Silviculture	Forest Protection
50	Prof. (Ret) Dr. Ir. Moch. Sambas Sn, M.Sc.	Professor (retired)	Silviculture	Agroforestry

Table 3.1 Teaching Staff of Forestry Science Doctoral Study Program (continued)

No.	Lecturer Name	Functional Position*	Department	Areas of Expertise
51	Prof. (Ret) Dr. Ir. Chafid Fandeli, M.S.	Professor (retired)	KSDH	Nature Tourism
52	Prof. (Ret) Dr. Ir. Djoko Marsono	Professor (retired)	KSDH	Forest Ecology
53	Prof. (Ret) Dr. Ir. Wahyu Andayani, M.S.	Professor (retired)	MH	Forest Resource Economics

* In accordance with UGM Rector Regulation No.7/2022, the lecturers with functional position of Professor and Associate Professor can be the Main Supervisor or Co-Supervisor. The functional position of Lector and Professor (retired) can only be a co-Supervisor.

3.3 PSDIK Administration Staff

PSDIK administrative staff consists of education personnel, both permanent and non-permanent employees. The administrative staff is tasked with providing services in the academic (secretarial), financial, and equipment fields. The following administrative staff support the implementation of academic activities at PSDIK.

Table 3.2 Administrative Staff of Forestry Science Doctoral Study Program

No.	Name	Tasks	Employment Status
1.	Frida Cahyaningrum, A.Md.	Administration/Sekretariat	Permanent Employees
2.	Daris Fahma Sutata, S.Hut	Administration/Sekretariat	Non-permanent Employees
3.	Lusi Heraningtyas, S.Hut	Administration/Sekretariat	Non-permanent Employees
4.	Sri Wahyuni, S.E.	Finance	Permanent Employees
5.	Wiji Wahono	Equipment	Permanent Employees

3.3 Laboratory

Faculty of Forestry UGM has 20 laboratories that function as a means of supporting the success of educational programs and the quality of graduates. The laboratories are managed by each department. The following laboratory facilities are available in each department.

A. Forest Management Department

1) Forestry Social Economics Lab

The Forest Resource Economics Laboratory organizes teaching, research, and development of forest resource economics group science.

- 2) Lab. Forest Development Planning (PPH)
The forest development planning laboratory organizes teaching, research, and science development in the fields of forest planning, social forestry, and forest management.
- 3) Computer and Biometrics Laboratory
The Computer and Biometrics Laboratory provides experimental and research data processing services. Students can utilize the facilities in the Computer and Biometrics Laboratory to process data on Forestry Development, Economic value of forests and the environment.
- 4) Forest Product Harvesting Laboratory (PHH)-
organizes teaching, research and development of PHH science.
- 5) Spatial Information System and Forest Mapping (SISPH) Laboratory
SISPH Laboratory organizes teaching, research and development of science related to remote sensing, aerial photo interpretation, photography, measurement and mapping, cartography, GIS, and land use. In addition, the SISPH laboratory also provides remote sensing data processing and interpretation services, spatial database preparation, map making, and land use and forest studies.

B. Silviculture Department

- 1) Silviculture and Agroforestry Laboratory- This laboratory organizes teaching, research, and development of Silviculture sciences.
- 2) Forest Protection and Health Laboratory This laboratory organizes teaching, research and development of forest protection sciences.
- 3) Tree Breeding Laboratory

The laboratory organizes teaching, research and development of tree breeding sciences.

- 4) Forest Physiology and Soils Laboratory
The laboratory organizes teaching, research and development of the sciences of Tree Physiology and Forest Soils in land / forest rehabilitation.

C. Department of Forest Products Technology

- 1) Wood Properties and Fundamentals Laboratory
The laboratory organizes teaching, research and scientific development in the fields of Wood Anatomy and Identification, Wood Physics, Wood Chemistry, Wood Mechanics and Wood Science.
- 2) Forest Products Processing Laboratory
The laboratory organizes teaching, research and scientific development in the fields of Energy, Extractive Product Management, Wood Drying, Wood Preservation, Wood Gluing, Forest Product Quality Control, and Biocomposite Technology.
- 3) Biomaterials Engineering Laboratory
The laboratory organizes teaching, research and development of knowledge in the fields of Wood Drying, Wood preservation, Wood modification, Sawing, Wood gluing, Wood finishing, and Biocomposite Technology.
- 4) Chemical Conversion and Biomaterials Laboratory
The laboratory organizes teaching, research and development of science in the fields of Energy, Chemistry and Wood Fiber, and Non-Timber Forest Products.
- 5) Wood Forming and Improvement Laboratory
The laboratory organizes teaching, research and development of science in the fields of Wood Anatomy and Wood Physics.

D. Forest Resources Conservation Department

- 1) Forest Ecology Laboratory
The Forest Ecology Laboratory organizes teaching, research and development in the field of Forest Ecology.
- 2) Watershed Management Laboratory
The Watershed Management Laboratory organizes teaching, research and scientific development in the fields of Watershed Management, Soil and Water Conservation, Forest Hydrology, Climatology and Climate Change, Hydrometeorological Disasters, and Forest and Land Rehabilitation.
- 3) Conservation Area Management Laboratory (PKK)
The PKK Laboratory organizes teaching, research, and development of science in the fields of nature conservation, environmental interpretation, and conservation area management.
- 4) Wildlife Management Laboratory
The PSL Laboratory organizes teaching, research and development of knowledge in the field of Wildlife Management which includes Wildlife Management Techniques, Wildlife Behavior and Rare Flora and Fauna Conservation.
- 5) Nature Tourism Management Laboratory
This laboratory organizes teaching, research and scientific development in the fields of Nature Tourism / Ecotourism, EIA, Urban Forestry, and Landscape Forestry.

In addition to the laboratories in each department, the Faculty of Forestry also has laboratories in the field or better known as "field campuses". With the field campus, students will find it easier to do practice and research directly. The field campuses owned by the Faculty of Forestry UGM are:

- 1) The Getas Field Campus, located in Ngawi, East Java, is a practice site for teak forest management in Java.
- 2) Wanagama Field Campus, located in Gunung Kidul Yogyakarta, as a place to practice critical land management and land rehabilitation.
- 3) Silvagama Field Campus in Muara Tebo, Jambi, as a place to practice tropical forest management outside Java.

3.4 Library

The Faculty of Forestry UGM Library, located in Building A, 1st floor, has a wide collection of books, magazines, scientific articles, proceedings, and various other written collections from within and outside the country that can be accessed by all students. Students can also read various thesis, thesis, and dissertation works from all alumni of the Faculty of Forestry UGM which are available to read in the reading room. In addition to these analog collections, the Faculty also provides *free access* to thousands of ebook collections, ejournals, emagazines, and various digital reference materials that can be accessed online, which are integrated through the <https://lib.ugm.ac.id/> page. To support student access to the digital collection, 10-unit computers are provided in the library area that can be used to *browse the* digital reference collection.

In addition to the library in the Faculty, collections of various reference books are also available in the department secretariat room, laboratories in the faculty, and also at lecturers, all of which can be borrowed by students with special requirements. In addition, students can also borrow books from the University Central Library, Postgraduate Library and libraries of other faculties in Universitas Gadjah Mada.

3.5 Lecture Halls and Study Spaces

Lecture activities at PSDIK are carried out in various classrooms in Building D 3rd floor of the Faculty of Forestry UGM, which have been equipped with various supporting facilities for lectures, including: *white boards*, projectors / digital TVs, *Air Conditioners* (AC), comfortable chairs, and audio-visual support facilities. In addition, 1 unit of printer is provided which can be accessed free of charge by students to print various lecture needs. For PSDIK students, there is also a shared study room with a capacity of 10 people to be used as a daily study place. In addition to these special study rooms, each PSDIK student can also access study rooms in each laboratory according to the dissertation research chosen by the student.

3.6 Information Technology Communication

To support academic activities and create a comfortable academic atmosphere, PSDIK uses Information and Communication Technology (ICT) systems that have been developed under the university system (centralized) including the UGM Academic Information System (AIS), Student Information System (SIMAWA), Library Information System (SIMPUS), and SIMASTER (Integrated School Management Information System).

Student IT and academic systems are supported by internet connections with bandwidth up to 100 Mbps. There are 30 free internet connection facilities (Hotspots) spread across the Faculty of Forestry. In addition, students can also access various software to support academic activities, including: Microsoft Office 2013, SPSS, MatLab, Minitab (accessible through dssdi.ugm.ac.id), as well as Turnitin and Wcopyfind (accessible through lib.ugm.ac.id), and various technical software including: ILWIS, PCI Geomatica 7.0. PC ArcView GIS, ArcGIS Pro v10.x, ENVI 4.0, Webex, Microsoft Teams, and Zoom Pro, etc.

3.7 Supporting Facilities Others

In addition to various learning support facilities available in study programs and faculties, PSDIK students can also access various facilities and support facilities within the scope of Universitas Gadjah Mada. These various supporting facilities include: 1) Student dormitories (with a rental system) in 4 existing residences: Bulaksumur Residence, Cemaralima Residence, Darmaputera Residence, and Ratnaningsih Residence, 2) Sports facilities in various places within UGM: madya stadium, baseball field, tennis court, student center, wisdom park (UGM valley), etc., 3) Health facilities at Gadjah Mada Medical Center (GMC), Prof. Soedomo Dental and Oral Hospital, and Academic Hospital (RSA), and various good quality canteens spread throughout UGM.

APPENDIX

APPENDIX 1.

LIST OF DOCTORAL PROGRAM COURSES (S3)

TABLE 1. A. COMPULSORY COURSES

No.	Code	Course Content	Sem	SKS	Lecturer
1	KTDU22801	Philosophy of Forestry Science	Odd/even	2	<ul style="list-style-type: none"> · Prof. Dr. Ir. TA. Prayitno · Prof. Dr. Ir. San Afri Awang · Prof. Dr. Ir. Satyawan P. · Prof. Dr. Ir. Suryo Hardiwinoto
2	KTDU22802	Forestry Research Methodology and Ethics	Odd/even	2	Teaching team from each thrust
3	KTDU22803	Sustainable Tropical Forest Development	Odd/even	2	<ul style="list-style-type: none"> · Prof. Dr. Ir. Ris Hadi Purwanto · Dr. Ir. Wahyu Wardhana · Prof. Dr. Ir. Budiadi · Dr. Ir. Sapto Indrioko · Dr. Ir. Lies Rahayu WF · Dr. Ir. M. Ali Imron · Dr. Ir. Gentur Sutapa
	Dissertation			30 *(38)	

TABLE 1.A. COMPULSORY COURSES (CONTINUED)

No.	Code	Courses	SKS	Lecturer
1	KTDU22804	Dissertation Proposal	4	Promotor + Examiner
2	KTDU22805	Dissertation Proposal Seminar	1	Promotor
3	KTDU22806	Comprehensive Examination	2	Promotor + Examiner
4	KTDU22901	Dissertation Research Paper	8	Promotor + Examiner
5	KTDU22902	Research Result Seminar 1	1	Promotor
6	KTDU22903	Research Result Seminar 2	1	Promotor
7	KTDU22904	Dissertation Research Publication 1	8	Promotor + Examiner
8	KTDU22905	Dissertation Research Publication 2	*(8)	Promotor + Examiner
9	KTDU22906	Research Result Seminar 3	1	Promotor
10	KTDU22907	Dissertation Examination	4	Promotor + Examiner + Additional Examiner

Description: * only for the *by research* students

TABLE 1.B. ELECTIVE COURSES OF FOREST MANAGEMENT THRUST

No.	Code	Course Content	Sem	SKS	Lecturer
1	KTDP22801	Capita Seleкта	Odd/even	2	Promoter
2	KTDM22801	Social Capital Analysis and SDH Development	Odd	2	· Prof. Dr. Ir. San Afri Awang
3	KTDM22802	Data Analysis Strategy	Even	2	· Prof. Dr. Ir. Ronggo Sadono · Dr. Ir. Wahyu Wardhana
4	KTDM22803	Forest Resource Economics and the Environment	Odd	2	· Dr. Ir. Dwiko Budi P. · Prof. Dr. Ir. Revelation Andayani
5	KTDM22804	Forest Ecosystem Modeling	Even	2	· Prof. Dr. Ir. Ronggo Sadono · Dr. M. Ali Imron
6	KTDM22805	International Forestry Political Regime	Even	2	· Prof. Dr. Ir. Ahmad Maryudi
7	KTDM22806	<i>Carbon Accounting</i>	Even	2	· Prof. Dr. Ir. Ris Hadi P
8	KTDM22807	Integrated Spatial Management	Odd	2	· Dr. Ir. Senawi · Dr. Ir. Emma Soraya
9	KTDM22808	Forest Governance	Even	2	· Prof. Dr. Ir. Ris Hadi P
10	KTDM22809	Tree and Forest Stand Modeling	Even	2	· Prof. Dr. Ir. Ronggo Sadono · Dr. Ir. Emma Soraya
11	KTDM22810	Ecological Anthropology and Political Ecology	Even	2	· Prof. Dr. Ir. San Afri Awang · Dr. Ir. Hery Santoso

TABLE 1.C. ELECTIVE COURSES OF SILVICULTURE THRUST

No.	Code	Course Content	Sem	SKS	Lecturer
1	KTDP22801	Capita Seleкта	Odd/even	2	Promoter
2	KTDS22801	Forest Land Productivity Management	Odd	2	<ul style="list-style-type: none"> · Dr. Ir. Daryono P · Dr. Ir. Handojo H · Dr. Dra. Winastuti · Dr. Ir. Haryono S · Dr. Ir. Arom F
3	KTDS22802	Quantitative Genetics	Odd	2	<ul style="list-style-type: none"> · Dr. Ir. Sapto Indrioko · Prof. Dr. Ir. Moh Na'iem
4	KTDS22803	Forest Health	Odd	2	<ul style="list-style-type: none"> · Dr. Ir. Musyafa' · Prof. Dr. Ir. Sri Rahayu · Dr. Ir. Ananto Triyogo
5	KTDS22804	Tropical Forest Intensive Slviculture	Odd	2	<ul style="list-style-type: none"> · Prof. Dr. Ir. Moh Naiem · Prof. Dr. Ir. Suryo Hardiwinoto · Prof. Dr. Ir. Sri Rahayu · Dr. Ir. Eny Faridah

TABLE 1.C. ELECTIVE COURSES OF SILVICULTURE THRUST (CONTINUED)

No.	Code	Course Content	Sem	SKS	Lecturer
6	KTDS22805	Quantification of Soil Biology	Odd	2	· Dr. Ir. Handojo HN · Dr. Dra. Winastuti · Dr. Ir. Musyafa · Dr. Ir. Arom F
7	KTDS22806	Root Physiology	Odd	2	· Dr. Dra. Winastuti · Dr. Ir. Eny Faridah · Dr. Ir. Handojo HN
8	KTDS22807	Silviculture ReGoration EcosiGem	Odd	2	· Prof. Dr. Ir. Priyono Suryanto · Prof. Dr. Ir. Budiadi · Dr. Ir. Widiyatno · Prof. Dr. Ir. Sambas SN · Prof. Dr. Ir. Sumardi
9	KTDS22808	Dynamics of Malesian Flora	Odd	2	· Prof. Dr. Ir. Moh Na'iem · Dr. Ir. DT. Adriyanti · Dr. Ir. Atus Syahbudin
10	KTDS22809	Ethnoculture of Malesian Flora	Even	2	· Prof. Dr. Ir. Moh Na'iem · Dr. Ir. Atus Syahbudin · Dr. Ir. DT. Adriyanti

TABLE 1.C. ELECTIVE COURSES OF SILVICULTURE THRUST (CONTINUED)

No.	Code	Course Content	Sem	SKS	Lecturer
11	KTDS22810	Tropical Forest Pest and Disease Management	Even	2	<ul style="list-style-type: none"> · Dr. Ir. Sri Rahayu · Dr. Ir. Ananto Triyogo · Dr. Ir. Musyafa'
12	KTDS22811	Siline-based AgroforeGri	Even	2	<ul style="list-style-type: none"> · Prof. Dr. Ir. Suryo Hardiwinoto · Prof. Dr. Ir. Budiadi · Dr. Ir. Widiyatno · Prof. Dr. Ir. Priyono Suryanto
13	KTDS22812	Ethnobotany	Even	2	<ul style="list-style-type: none"> · Dr. Ir. Atus Syahbudin · Dr. Ir. DT. Adriyanti · Prof. Dr. Ir. Moh Na'iem
14	KTDS22813	Reproductive Biology of Tropical Plants	Even	2	<ul style="list-style-type: none"> · Dr. Ir. Yeni W.N. Ratnaningrum · Prof. Dr. Ir. Moh Na'iem
15	KTDS22814	Advanced Silviculture	Even	2	<ul style="list-style-type: none"> · Prof. Dr. Ir. Suryo Hardiwinoto · Dr. Ir. Widiyatno

TABLE 1.D. ELECTIVE COURSES OF FOREST PRODUCT TECHNOLOGY THRUST

No.	Code	Course Content	Sem	SKS	Lecturer
1	KTDP22801	Capita Selektta	Odd	2	Promotor
2	KTDT22801	Wood and Resin Relationship	Odd	2	· Prof. Dr. Ir. TA Prayitno · Dr. Ir. M. Navis Rofii
3	KTDT22802	Wood Fiber Forensics	Odd	2	· Prof. Dr. Ir. Sri Nugroho Marsoem · Dr. Ir. Fanny Hidayati
4	KTDT22803	Science and Engineering Biomaterials	Even	2	· Prof. Dr. Ir. Ragil Widyorini · Dr. Ir. Tomy LiGyanto
5	KTDT22804	Pre-treatment Technology of Lignocellulosic Materials	Odd	2	· Dr. Ir. Denny Irawati · Dr. Ir. JP. Gentur Sutapa
6	KTDT22805	Bioactivity of Essential Oils	Even	2	· Dr. Ir. Rini Pujiarti · Dr. Ir. Sigit Sunarta · Prof. Dr. Ir. Ganis Lukmandaru
7	KTDT22806	Wood Structure and Environment	Odd	2	· Dr. Ir. Widyanto DN
8	KTDT22807	Chemistry of Wood Adhesives and Their Applications	Odd	2	· Prof. Dr. Ir. Ragil Widyorini · Prof. Dr. Ir. Ganis Lukmandaru

TABLE 1.D. ELECTIVE COURSES OF FOREST PRODUCT TECHNOLOGY THRUST (CONTINUED)

No.	Code	Course Content	Sem	SKS	Lecturer
9	KTDT22808	Fundamental Aspects of Tropical Wood Drying	Odd	2	<ul style="list-style-type: none"> · Dr. Ir. Y. Suranto · Dr. Ir. Tomy LiGyanto
10	KTDT22809	Science and TechnologyEco-friendly Wood Preservation	Even	2	<ul style="list-style-type: none"> · Dr. Ir. Y. Suranto · Dr. Ir. Tomy LiGyanto
11	KTDT22810	UltraTropical Wood Structure	Even	2	<ul style="list-style-type: none"> · Dr. Ir. Widyanto DN
12	KTDT22811	EkGraktif and Wood Color	Even	2	<ul style="list-style-type: none"> · Prof. Dr. Ir. Ganis Lukmandaru · Dr. Ir. Rini Pujiarti
13	KTDT22812	Wood Vinegar Science and Technology	Even	2	<ul style="list-style-type: none"> · Prof. Dr. Ir. Ganis Lukmandaru · Dr. Ir. Sigit Sunarta
14	KTDT22813	Tropical Wood Machining Technology	Even	2	<ul style="list-style-type: none"> · Dr. Ir. Tomy LiGyanto · Prof. Dr. Ir. Ganis Lukmandaru

TABLE 1.E. ELECTIVE COURSES OF FOREST RESOURCE CONSERVATION THRUST

No.	Code	Course Content	Sem	SKS	Lecturer
1	KTDP22801	Capita Selekt	Odd/Even	2	Promoter
2	KTDK22801	Land Conservation and Rehab	Odd	2	· Dr. Ir. Ambar Kusumandari · Dr. Ir. Hatma Suryatmojo
3	KTDK22802	Conservation Area ReGoration	Even	2	· Dr. Ir. Lies Rahayu · Dr. Ir. Hatma Suryatmojo · Dr. Ir. Hero Marhaento · Dr. Ir. Sena Adi S.
4	KTDK22803	Conservation of Natural Resources and Environment	Odd	2	· Prof. Dr. Ir. Djoko Marsono · Dr. Ir. Hatma Suryatmojo
5	KTDK22804	Tropical Hydrology	Odd	2	· Dr. Ir. Ambar Kusumandari · Dr. Ir. Hatma · Suryatmojo
6	KTDK22805	Quantitative Ecology	Odd	2	· Prof. Dr. Ir. Emy Poedjirahajoe · Prof. Dr. Ir. Djoko Marsono
7	KTDK22806	Evaluation of Conservation Area Management	Even	2	· Dr. Ir. Much Taufik Tri Hermawan · Dr. Ir. Hero Marhaento

TABLE 1.E. ELECTIVE COURSES OF FOREST RESOURCE CONSERVATION THRUST (CONTINUED)

No.	Code	Course Content	Sem	SKS	Lecturer
8	KTDK22807	Advanced Ecosystem Ecology	Even	2	· Prof. Dr. Ir. Emy Poedjirahajoe · Prof. Dr. Ir. Djoko Marsono
9	KTDK22808	Genetic Conservation / KEHATI Conservation	Odd	2	· Prof. Dr. Ir. Satyawan Pudyatmoko · Dr. Ir. Sena Adi Subrata
10	KTDK22810	Advanced Aquatic Ecology	Odd	2	· Prof. Dr. Ir. Emy Poedjirahajoe · Dr. Ni Putu Diana Mahayani
11	KTDK22811	Advanced Wildlife Management	Odd	2	· Prof. Dr. Ir. Satyawan Pudyatmoko · Dr. Ir. Moh. Ali Imron
12	KTDK22812	Wetland/Brackish Ecology	Even	2	· Prof. Dr. Ir. Emy Poedjirahajoe · Dr. Munasik
13	KTDK22813	Conservation Business	Even	2	· Dr. Ir. Lies Rahayu · Prof. Dr. Ir. Chafid Fandeli
14	KTDK22814	Ecotourism Management	Even	2	· Dr. Ir. Kaharuddin · Prof. Dr. Ir. Chafid Fandeli

APPENDIX 2. COURSE SYLLABUS of DFS

1. KTDU22801 Philosophy of Forestry Science, 2 credits

Lecturers: Prof. Dr. Ir. TA. Prayitno, Prof. Dr. Ir. San Afri Awang,
Prof. Dr. Ir. Satyawan Pudyatmoko, Prof. Dr. Ir.
Suryo Hardiwinoto

Description:

The Philosophy of Science course studies philosophy in general and the scientific classification of philosophy, the position of philosophy of science in general philosophy, the process of philosophical thinking in accordance with the purpose of philosophical thinking, the history of science from ancient times, Greece, medieval, to modern times, the nature of science as the basis of knowledge starting from the ontology of science, epistemology of science, and axiology of science, the process of reasoning as a means of scientific thinking, and scientific methods to achieve an understanding of truth. In addition, the application of philosophy of science in the material object of forestry science education is discussed, especially in relation to forestry science dissertations.

Library:

1. Bahm, Archie J. 1995. Epistemology Theory of Knowledge. Las Lomas Rdd. N.E.
2. Hardono Hadi. 1994. Epistemology of Philosophy of Knowledge (Translation of The Philosophy of Knowledge). Yogyakarta: Kanisius.

2. KTDU22802 Forestry Research Methodology and Ethics, 2 credits

Lecturers: Teaching Team from each interest (lab representative)

Description:

Lectures are given to each student in the same thrusts (Forest Management, Silviculture, Forest Resources Conservation and Forest Products Technology)

This course addresses the fundamentals of developing forestry science through dissertation research, including scientific theories and their benefits for research, components and properties of theories, research propositions, fundamentals of analysis in research, principles of measurement and experimental analysis. The discussion also raises cases of field, nursery and or laboratory research in the fields of study i n t h e four existing interests.

Library:

1. Ford ED. 2004. Scientific Method for Ecological Research. Cambridge: Cambridge University Press. 588p.
2. Bastian O, Steinhardt U. 2002. Development and Perspectives of Landscape Ecology. Dordrecht: Kluwer Academic Publishers. 498p.
3. Research journals according to r e s e a r c h interests.

3. KTDU 22803 Sustainable Tropical Forest Development, 2 credits

Lecturers: Prof. Dr. Ir Ris Hadi Purwanto, Dr. Ir Wahyu Wardhana, Prof. Dr. Ir Budiadi, Dr. Ir Sapto Indrioko, Dr. Ir Lies Rahayu WF, Dr. Ir M Ali Imron, Dr. Ir Gentur Sutapa

Description:

The meeting raised the relevance of the concepts of sustainable *development* and sustainable *forest management* in Indonesia's tropical forests, the application of silvicultural principles in supporting the preservation and development of sustainable forest resources in Indonesia, the concepts of conservation biology in spatial management and species conservation to support sustainable tropical forest development, as well as the identification of conservation strategies at global, national, and local scales, and the design of the implementation of sustainability principles.

in the forest product processing industry and forest product development.

Library:

1. Biggs R, Schluter M, Schoon ML (eds). 2015. Principles for Building Resilience: Sustaining Ecosystem Services in Social-Ecological Systems. Cambridge University Press, UK. 282p.
2. Davis LS, Johnson KN, Bettinger P, Howard T. 2001. Forest Management to Sustain Ecological, Economic, and Social Values. 4th Edition. McGraw Hill Higher Education. New York, USA.
3. Fujimori T. 2001. Ecological and Silvicultural Strategies for Sustainable Forest Management. Elsevier, Tokyo, Japan.

4. KTDP22801: CAPITA SELECTA

Lecturers: Promotor team of each student Description:

This elective course is organized through the agreement of students and promoters/promoter team. In 14 meetings in a semester, the promoter/promoter team and students discuss the development of research topics into a draft research proposal. The form of development can be in the form of pre-research assignments, literature studies, writing scientific papers, or journal comparisons which are then used as material for compiling a draft dissertation proposal. The target of this lecture is that students can produce a draft dissertation research proposal to be presented in a proposal seminar.

Literature: Libraries (books, journals, other references) relevant to the theme of student research

5. KTDM22802 Data Analysis Strategy, 2 credits

Lecturers: Prof. Dr. Ir. Ronggo Sadono, Dr. Ir. Wahyu Wardhana

Description:

Understanding of data collection and analysis techniques in the field of natural resource management, especially forests, landscape and forest land, wildlife, and social communities. From the analysis of data on selected forest ecosystems, it is then formulated in a manuscript for accredited national journals, namely: Indonesian Journal of Forestry Research (IJFR), Journal of Tropical Forest Management (JMHT), Journal of degraded and mining lands management (JDMLM), and Biodiversity.

Library:

1. Okes D. 2019. Root Cause Analysis. Second Edition: The Core of Problem Solving and Corrective Action. ASQ Quality Press.
2. Kröger M. 2021. Studying Complex Interactions and Outcomes Through Qualitative Comparative Analysis: A Practical Guide to Comparative Case Studies and Ethnographic Data Analysis. Routledge.
3. Berbel J, Bournaris T, Manos B, Matsatsinis N, Viaggi D. 2018. Multicriteria Analysis in Agriculture. Springer International Publishing.

6. KTDM22803 Forest Resource and Environmental Economics, 2 credits

Lecturers: Dr. Ir. Dwiko Budi Permadi, Prof(ret). Dr. Ir. Wahyu Andayani

Description:

This course studies concepts and theories related to the economics of forest resources & the environment (ESDH-L) as input to management policies, and is an implementation of the theory of environmental economics of SDH. Thus the theory that will be studied in the course "Economics of Forest Resources & Environment (ESDH-L)" contains subjects about understanding, principles of forest resource economics & the environment, economic systems and declining environmental functions, classification of natural resources (Forest), forest resources perspectives (Malthusian, Recadian), scarcity, the relationship between SDH and

economics, externalities, public goods, market failure mechanisms, economic inefficiency, pollution economics, determination of SDH environmental valuation policy instruments to protect SDH, environmental management financing, international trade and its impact on the SDH environment, regulations related to trade in SDH products by accommodating environmental aspects, economic policies, environmental regulations (incentives, public welfare). The material studied above, in brief, includes: (1) History of the birth of forest resource economics (ESDH) and environmental economics (E-L), basic concepts and theories, methods and valuation of environmental economics of SDH (renewable resources (RR), non-renewable resources / NRR), factors that cause environmental degradation / degradation (business, waste / pollution, climate change, international trade), (2) Theories and concepts of sustainable development, economics of pollution, valuation techniques, regulation, determination of the economic value of environmental taxes (green taxes, incentives, externalities, market failures, inflation, the concept of brown-green national income), measurement of environmental damage by methods: Total Economic Value, Hedonic Price Approach, Contingent Value Method, Travel Cost Method, Willingness To Pay, Willingness To Accept, (3) Policy and implementation, economics of forest resources and the environment (ESDH-L) related to international trade aspects, the subjects studied include: regulation, property rights, regulation / determination of taxes (conservation, transformation, green taxes, effluent charges), incentives, subsidies, institutions, and (4) Discussion of related journals.

Library:

1. Daly, H.E. and J. Farley. 2011. Ecological Economics: Principles and Applications, Second Edition. Island Press. Washington, Covelo, London.
2. Davis, L.S., K.N. Johnson, P.S. Bettinger & T.E. Howard. 2001. Forest Management: To Sustain Ecological,

- Economic and Social Values, Fourth Edition. McGraw-Hill, New York.
3. Hufschmidt, M.M., D.E. James, A.D. Meiser, B.T. Bower and J.A. Dixon. 1983. Environment, Natural Systems, and Development: An Economic Valuation Guide. The Johns Hopkins University Press. Baltimore and London.
 4. Pearce, D.W. and R.K. Turner. 1990. Economics of Natural Resources and the Environment. Harvester Wheatsheaf. New York, USA.
 5. Turner, R.K., David, W.P., Ian Bateman. 1994. Environmental Economics: An Elementary Introduction. T.J Press (Padstow) Ltd. Cornwall.

7. KTDM22804 Forest Ecosystem Modeling, 2 credits

Lecturers: Prof. Dr. Ir. Ronggo Sadono, Dr. Ir. Muhammad Ali Imron, Dr. Ir. Wahyu Wardhana

Description:

The course is included in supporting subjects in understanding complex phenomena/processes in the field of forest ecosystems and natural resource management. The substance of the study includes understanding the concept of forest ecosystem systems and analysis, understanding models and modeling of forest ecosystems. From this understanding, the focus of the study is directed to the field of natural resource management, especially forests, landscapes and forest lands, wildlife and social communities, namely analyzing complex systems in these fields to be formulated in a model. It is expected that this understanding can contribute to practical decision making and monitoring and evaluation of these decisions.

Library:

1. Bossel, H. 2007. Systems and Models. Complexity, Dynamics, Evolution, Sustainability. Books on Demand GmbH, Norderstedt, Germany.
2. Grant, W.E., E.K. Pedersen & S.L. Marin. 1997. Ecology and Natural Resource Management. System Analysis and Simulation. John Wiley & Sons, Inc. USA.

3. Grant, W.E. & T.M. Swannack. 2008. Ecological Modeling: A common-sense approach to theory and practice. Blackwell Publishing.
4. Grimm V&S Railsback. 2005. Individual-based Modeling and Ecology. Individual Model Ecol 1- 432. doi: 10.1111/j.1467- 2979.2008.00286.x
5. Purnomo, H. 2012. Modeling and Simulation for Adaptive Management of Natural Resources and Environment. IPB Press.

8. KTDM 22807 Integrated Spatial Management, 2 credits

Lecturers: Dr. Ir. Senawi, Dr. Ir. Emma

SorayaDescription:

In this course, students are expected to be active in discussions on the importance of forest resources and integrated regional spatial planning in sustainable national development; optimal application of theories, methods, and knowledge of regional spatial planning and the interrelationships between its components in the management of forest resources as part of the landscape; theories and methods of measuring and allocating forest resources in regional/watershed spatial planning for erosion control and water availability so as to be able to find, communicate, and develop concepts/theories and techniques of land evaluation and forestry spatial planning at the macro-regional-unit site scale in published research results; apply concepts, select, and criticize tools in planning and monitoring optimal allocation of space and land in accordance with biogeophysical characteristics and social conditions of the site.

Library:

1. Asdak, C. 2002. Hydrology and watershed management. Gadjah Mada University Press.
2. Carr and Zwick, 2007, Smart Land-Use Analysis: The LUCIS Model. ESRI Press.
3. Hardjowigeno S & Widiatmaka. 2020. Land Suitability Evaluation & Land Use Planning.

4. Jayadinata, J.T., 1999. Land use in rural urban and regional planning. Publisher of ITB Bandung.
5. Rayes ML. 207. Land Resource Inventory Methods. Yogyakarta: Publisher: ANDI

9. **KTDM22809 Forest Tree and Stand Modeling, 2cr**

Lecturers: Prof. Dr. Ir. Ronggo Sadono, Dr. Ir. Emma Soraya

Description:

The substance of the study includes production quantification method of forest, including timber, biomass, carbon and energy. Forest production that must be disclosed quantitatively is the growth and yield of forest stands managed for sustainability, especially the economic sustainability of production, environmental services in the form of carbon storage and energy potential. Factors specifically discussed intensively are: tree weight and biomass estimation and modeling; carbon storage calculation; evaluating site quality; description and analysis of stand structures; quantifying stand density; quantifying tree crowns; indices of individual- tree competition; growing space and competitive situation of individual trees; interrelation between forest stand structure and biomass and carbon storage; forest stand modeling; and development of land use and land cover, biomass, and carbon storage.

Library:

1. Burkhart, H.E. and M. Tomé. 2012. Modeling Forest Trees and Stands. Springer.
2. Gadow, K., Gonzales, J.G.A., Zhang, C., Pukkala, T. and Zhao X. 2021. Sustaining Forest Ecosystems. Springer.
3. Kumar, M., Dhyani, S. and Kalra, N. eds. 2022. Forest Dynamics and Conservation Science, Innovations and Policies. Springer.
4. Pretzsch, H. 2009. Forest Dynamics, Growth and Yield. Springer.

10. KTDS22801 Forest Land Productivity Management, 2 credits

Lecturers: Dr. Ir. Daryono Prehaten, Dr. Ir. Handojo Hadi Nurjanto, Dr. Dra. Winastuti Dwi Atmanto, Dr. Ir. Haryono Supriyo, Dr. Ir. Arom Figyantika

Description:

Topics raised in this lecture include the role of land, site and soil, chemical fertility, soil physics and soil mineralogy on forest land productivity, problems causing a decrease in land productivity due to natural causes, anthropogenic and global climate change. Other topics discussed are agroforestry-based land rehabilitation and various efforts to increase forest land productivity through integrated organic matter management and the use of microorganisms.

Library:

1. M.A.S. Graca, F. Barlocher and M.O. Gessner. 2005. Methods to study litter decomposition. A practical guide. Springer. Netherland.
2. W.L. Kutsch, M. Bahn and A. Heinemeyer. 2009. Soil Carbon Dynamics. An integrated methodology. Cambridge University Press. Cambridge.
3. Foth, H.D. 1990. Fundamentals of Soil Science. 8th edition, John Wiley & Sons Inc. New York. 360 pp.
4. UNEP. 2014. UNEP Year Book Emerging Issues in Our Environment 2014. Nairobi 66pp.

11. KTDS22802 Quantitative Genetics, 2 credits

Lecturers: Dr. Ir. Sapto Indrioko, Prof. Dr. Ir. Mohammad

Description:

The Quantitative Genetics course discusses quantitative traits, heritability analysis, role estimation gene, genotype-environment interaction analysis, breeding value prediction methods for genetic testing in forestry crops.

Library:

1. Xu, S. 2022. Quantitative genetics. 2022. Springer Nature Switzerland AG, Cham.
2. White, L., Adams, W.T., Neale, D.W. 2007. Forest Genetics. Cabi Publishing.
3. Fins, L., Friedman, S.T., Brotsschol, J.V. (eds.). 1992. Handbook of quantitative forest genetics. Kluwer Academic Publishers.
4. White, T.L., Hodge, G.R. 1989. Predicting breeding values with applications in forest tree improvement. Kluwer Academic Publishers, Dordrecht.

12. KTDS22803 Forest Health, 2 credits

Lecturers: Dr. Ir. Musyafa', Prof. Dr. Ir. Sri Rahayu, Dr. Ir. Ananto Triyogo

Description:

This course is designed to equip students to be able to manage forests productively and sustainably through an understanding of forest health, both in concept and application in the field. The main aspects that will be discussed in this course are the concept of healthy forests, ecological components in healthy forests, causes of forest health disorders and the importance of forest health in maintaining forest function and productivity. The basic principles of environmentally sound forest management will also be discussed.

The course objectives will be achieved by theoretical review through current literature and discussion with case studies.

Library:

1. Castello, JD and SA.Teale. 2011. Forest Health an Integrated Perspective. Cambridge Univ. Press.
2. Asiogbu, FO and A. Kovalchuk. Eds. 2023. Forest Microbiology Tree Diseases and Pests, Volume 3. Elsevier. AP.

3. Asiegbu, FO and A. Kovalchuk. Eds. 2021, Forest Microbiology Tree Microbiome: Phyllosphere, Endosphere, and Rhizosphere, Volume 1. Elsevier. AP.
4. Edmonds, R.L., J.K.. Agee, and RI Gara. 2005. Forest Health and Protection. Wavelend Pres, Inc.

13. KTDS22804 Tropical Forest Intensive Silviculture, 2 credits

Lecturers: Prof. Dr. Ir. Suryo Hardiwinoto, Prof. Dr. Ir. Moh. Naiem, Dr. Ir. Musyafa, Dr. Ir. Eny Faridah

Description:

The Intensive Silviculture of Tropical Forests course covers the development of silviculture systems in tropical countries in general and Indonesia in particular; comparing silviculture systems implemented in Indonesia; the role of silviculturists in maintaining forest and environmental functions, identification of intensive silviculture components (tree breeding, environmental manipulation, integrated pest control) for several forest types and habitats, and their application for sustainable management of natural and planted forests.

Library:

1. Nyland RD. 2002. Silviculture: Concept and Application. 2nd edition. McGraw Hill. 628p.
2. McEvoy TJ. 2014. Introduction to Forest Ecology and Silviculture. 3rd edition. Forestry Press. 180p.
3. Smallwood MF, Calvert CM, Bowles DJ (eds). 1999. *Plant Responses to Environmental Stress*. Oxford, BIOS-Scientific Publishers Ltd.
4. Kramer PJ, Kozlowski TT. 1979. Physiology of Woody Plants. Academic Press. 811p.
5. Wainhouse D. 2005. Ecological Methods in Forest Pest Management. Oxford UP. 225p

14. KTDS22805 Quantification of Soil Biology, 2 credits

Lecturers: Dr. Ir. Handojo Hadi Nurjanto, Dr. Dra. Winastuti Dwi Atmanto, M.P., Dr. Ir. Musyafa, Dr. Ir. Arom Figyantika

Description:

This course covers topics on soil biological fertility, organic matter, the role, calculation of the number and biomass of soil microorganisms. Rhizosphere, calculation of population size of nitrogen-fixing and phosphate-solubilizing microorganisms, role, population density assessment methods, extraction methods, and measurement of soil fauna biomass.

Library:

1. R.L. Tate. 1995. Soil Microbiology. John Wiley & Sons, Inc, New York.
2. E.A. Paul and F.E. Clark. 1989. Soil Microbiology and Biochemistry. Academic Press, Inc, London.
3. N.S.S. Rao. 2001. Soil Microbiology. Science publisher, Inc,
4. H.W. Seeley and P.J. VanDemark. 1972. Microbes in Action. A Laboratory Manual of Microbiology. Freeman and Co. San Francisco.
5. Gorny, M. & Grum, L. 1993. Methods in Soil Zoology

15. KTDS22806 Root Physiology, 2 credits

Lecturers: Dr. Dra. Winastuti Dwi Atmanto, Dr. Ir. Eny Faridah, Dr. Ir. Handojo Hadi Nurjanto

Description:

The Root Physiology course discusses various types of root systems, the development of root structure, anatomy, histology and cytology, root function, and root metabolism in young and mature root cells, nutritional physiology in roots which includes absorption and transport of water and minerals, the role and interaction of roots with various soil microorganisms (mycorrhizae, nitrogen-fixing bacteria, and non-symbiotic bacteria), and the role of roots in soil environmental problems which include drought, salinity and oxygen deficiency.

Library:

1. Kolek J & V Kozinka. 1992. Physiology of Plant Root System. Kluwer Academic Publishers, The Netherlands.
2. Emons AMC & T Katelaar. 2009. Root Hairs. Plant Cell Monographs. Germany.
3. Kroon H & EJW Visser (Eds). 2003. Root Ecology. Springer-Verlag, Berlin.
4. Nilsen ET & DM Orcutt. 1996. Physiology of Plants under Stress -Abiotic Factors. John Wiley & Sons, New York.
5. Smit AL, AG Bengough, C Engels, M Noordwijk, S Pellerin & SC Geijn. 2000. Root Methods. A Handbook. Springer-Verlag, Berlin.

16. KTDS22807 Ecosystem restoration silviculture, 2 credits

Lecturers: Prof. Dr. Ir. Priyono Suryanto, Dr. Ir. Widiyatno, Dr. Ir. Ananto Triyogo, Prof. Dr. M. Sambas Sabarnudin, and Prof. Dr. Ir. Sumardi

Description:

The Ecosystem Restoration Silviculture (SRE) course is based on the projection of scientific mandatories that place SRE as an important and strategic pillar in Indonesia's prospective forestry governance. The SRE module introduces the process of restoring damaged forest ecosystems through a review of silvicultural theory as a basis for conceptualizing SRE concepts and techniques as part of silvicultural interventions. The focus is on how silvicultural techniques have evolved for ecosystem restoration as a basis for consideration in modifying based on rationalization to project and structure SRE regimes. The paper is sharpened by abstracting an SRE regime integrated with appropriate science and technology that is unique to its forest ecosystem mandate.

The SRE course begins with a review of silvicultural theory underlying restoration techniques integrated with an understanding of the physical, biological characteristics of forest ecosystems and their importance to be maintained and restored. Changes in forest ecosystems due to natural damage and/or human activities including the concept of succession and modification through accelerated succession management are discussed in relation to the philosophical and ethical framework of restoration.

Silvicultural treatments at the stand level and their influence on restoration parameters such as vegetation composition, stand structure, tree growth, animal populations are part of the subject matter to rationalize the basis for SRE regime development. The influence of silvicultural treatments on forest health and climate change mitigation is also discussed in this course through the projection of integrated regimes in biophysical engineering for productive ecosystem restoration.

Learning in this course is intended to enable students to abstract the SRE regime by understanding, designing and applying processes and assessments of forest ecosystems that have been damaged and developing recommendations for their restoration using factual scientific analysis. Students are able to abstract this by combining the basic concepts of forest restoration including opportunities for implementation with prospective agroforestry approaches with inspiring examples of restoration as part of a broader effort to restore tropical forest landscapes.

Library:

1. Nyland, R. D. 2004. *Silviculture, Concepts and Applications*. The McGraw-Hill Companies, Inc. New York.
2. Donald A. Falk, Margaret A. Palmer, and Joy B. Zedler. 2006. *Foundations of Restoration Ecology*. Island Press.
3. Jelte van Andel and James Aronson. 2006. *Restoration Ecology* The New Frontier. Blackwell Publishing.

4. Andre F. Clewell and J. Aronson. 2007. Ecological Restoration: Principles, Values, and Structure of an Emerging Profession. Island Press.
5. Jeffrey Sayer and Stewart Maginnis. 2005. Forests in Landscapes: Ecosystem approaches to sustainability. Earthscan.

17. KTDS22808 Dynamics of Malesian Flora, 2 credits

Lecturers: Dr. Ir. Atus Syahbudin, Dr. Ir. Dwi Tyaningsih
Adriyanti, Prof. Dr. Ir. Mohammad Na'iem

Description:

The Malesian Flora Dynamics course discusses the history of the existence of flora in the world in general to its dynamics specific to the Malesian region, including flora characteristics according to forest formation.

Library:

1. <https://floramalesiana.org/new/fm-symposia/>
2. <http://lipi.go.id/>

18. KTDS22809 Ethnoculture of Malesian Flora, 2 credits

Lecturers: Dr. Ir. Atus Syahbudin, Dr. Ir. Dwi Tyaningsih
Adriyanti, Prof. Dr. Ir. Mohammad Na'iem

Description:

The Ethnoculture of Malesian Flora course discusses the history, meaning and contribution of flora to human life, especially in the Malesian region.

Library:

1. <http://lipi.go.id/>
2. <https://floramalesiana.org/new/fm-symposia/>
3. P.C. Trivedi & N. Sharma, 2011. Textbook of Ethnobotany. Pointer Publishers, Jaipur.
4. Kim J. Young, 2006. Ethnobotany. Chelsea House Publications

19. **KTDS 22810 Tropical Forest Pest and Disease Management, 2 credits**

Lecturers: Prof. Dr. Ir. Sri Rahayu, Dr. Ir. Ananto Triyogo, Dr. Ananto Triyogo, Ir. Musyafa'

Description:

This course discusses the theories, concepts and principles of the development of forest plant damage due to pests and disease-causing pathogens, which will be used as a basis for decision making in its integrated management. Further discussion on how to integrate chemical, biological, physical, and other silvicultural management techniques so that economically, ecologically and socially are still at a tolerable or acceptable threshold.

The management of important pests and diseases that attack leaves, crowns, stems and branches, roots as well as seeds and fruits in the ecosystems of plantation forests, natural production forests, urban forests and community forests is a major topic in order to develop an integrated pest and disease management program that supports the sustainability of tropical forest ecosystems.

Library:

1. Good practices for forest health protection. 2023. <https://www.fao.org/3/i2080e/i2080e03.pdf>
2. Integrated pest and disease management, uploaded by: CGIAR, Mar 10, 2021, 1.52K This webinar, the third in a series of four by CGIAR for the 2020 International Year of Plant Health, will examine integrated approaches for sustainable management. <https://www.youtube.com/watch?v=2ny-1dD5Ht0>
3. Arun Arya and Analía Edith Perelló. 2010. Management of Fungal Plant Pathogens. CABI Publishing. 403 p.
4. FAO. 2009. Global Review of Forests Pests and Diseases. Series: FAO Forestry Paper. Food and Agriculture Organization, Vol. 56. 222 p.
5. Tree Health and Plantation Forestry Consultants Report 2 February, 2007. file:///C:/Users/Sri%20Rahayu/Downloads/FTRtreehealthKalimantan.pdf

20. **KTDS22811 Silin-based Agroforestry, 2 credits**

Lecturers: Prof. Dr. Ir. Suryo Hardiwinoto, Prof. Dr. Ir. Budiadi,
Dr. Ir. Widiyatno, Prof. Dr. Ir. Priyono Suryanto

Description:

Agroforestry is a land use system that synergizes the forestry, agriculture and environmental sectors and has been widely accepted as a form of land management both inside and outside forest areas. Forestry and agriculture both work with climatic and soil factors to produce goods and services. Both are linked to intricate and complex ecological webs of plant and animal resources and their environments. The development and maintenance of forest stands in agroforestry is done by synergizing the application of intensive silvicultural and agricultural techniques. Managers and landowners carry out activities through appropriate techniques and methods in maintaining, harvesting and rejuvenating periodically so as to fulfill the principle of sustainability.

Agroforestry Based on Intensive Silviculture is a science that implements science, technology and art in building and maintaining mixed forest stands between forestry plants and agricultural crops in depth. Agroforestry Based on Intensive Silviculture (KTB 811) has a weight of 2 credits (2.0) and is an elective course in the Doctor of Forestry Science Program, Faculty of Forestry UGM. This course covers material on agroforestry patterns that can increase forest value for forest sustainability, food security and the environment. The lecture material includes the development of silvicultural systems for agroforestry, resource sharing systems to increase the value of forests, agroforestry land productivity and the development of site- based agroforestry patterns including agroforestry, silvopastura, silvofishery and others.

Library:

1. Beukema, H., Danielsen, F., Vincent, G., Hardiwinoto, S. and Van Andel, J. 2007. Plant and Bird Diversity in Rubber Agroforests in the Lowlands of Sumatra,

- Indonesia. *International Journal of Agroforest Syst.*, 70: 217-242.
2. Hardiwinoto S. 2015. *The Role of Silviculture in Improving Forest Productivity and Land Rehabilitation. Professor Inaugural Speech.* Yogyakarta: Gadjah Mada University
 3. Jones D. T., Susilo F. X., Bignell, D. E, Hardiwinoto S., Gillison A. N., Eggleton P., 2003. Termite assemblage collapse along a land use intensification gradient in low land central Sumatra, Indonesia. *Journal of Applied Ecology* 40: 380-391.
 4. Kusmana C. 1997. *Vegetation Survey Methods.* Bogor: Publisher of Bogor Agricultural University.
 5. Lamb D, Gilmour D. 2003. *Rehabilitation and restoration of degraded forests.* IUCN, Gland, Switzerland and Cambridge, UK and WWF, Gland, Switzerland.

21. KTDS22812 Ethnobotany, 2 credits

Lecturers: Dr. Ir. Atus Syahbudin, Dr. Ir. Dwi Tyaningsih
Adriyanti, Prof. Dr. Ir. Mohammad Na'iem

Description:

The Ethnobotany course discusses the basis of human relationships with nature, especially plants, the influence of plants on human life patterns to the use of plants in human daily life.

Library:

1. C. M. Cotton, 1996. *Ethnobotany: Principles and Applications.* Published by Wiley.
2. A K Ghosh, 2013. *Indigenous Knowledge on Ethnobotany.* Daya Publishing House.

22. KTDS 22813 Tropical Plant Reproductive Biology, 2 credits

Lecturers: Dr. Ir. Yeni W.N. Ratnaningrum, Prof. Dr. Ir. Mohammad Na'iem

Description:

The Tropical Plant Reproductive Biology course covers several topics starting with an introduction to plant reproductive biology; followed by a review of flowering characters including flower biology, flowering ontogeny, phenology, sexual systems, and the structure and spatial arrangement of flowers.

The next topic is pollination events that include plant-pollinator interactions, pollination mechanisms/syndromes, and gene flow; followed by the topic of genetic mechanisms in plant sexual reproduction, including self-incompatibility and deep-cross depression.

The next topic is mating systems, which includes mating classifications (out-crossing, in-crossing, and mixed mating, as well as assortative and disassortative mating) and their consequences on reproductive output and genetic diversity.

The next topic is reproductive outcomes, which refers to the results of the reproductive phase after the pollination and fertilization process, with parameters including Pollination Effectiveness, Reproductive Success, seed germination (viability and vigor), natural regeneration and seedling survival.

At the end of the lecture, some plant evolutionary strategies developed to adapt to environmental changes (i.e. to increase the likelihood of outcrossing), will also be discussed. Some topics are also complemented by material on genetic control and factors of environment that plays an important role in each reproductive process. Methods of assessing each reproductive parameter are also included.

Library:

1. Lowe A., Harris S., Ashton P. 2004. Ecological Genetics: Design, Analysis and Application. Blackwell Science Ltd. Oxford OX4 2DQ.
2. Roubik D.W., Sakai S., Karim A.A.H. 2005. Pollination Ecology and the Rain Forest. Springer Science + Business Media Inc. New York NY 10013.
3. Bawa K.S., Hadley M. 1990. Reproductive Ecology of Tropical Forest Plant. UNESCO, Paris.
4. Ghazoul J. 1997. Field studies of forest tree reproductive ecology. ASEAN-Canada Forest Tree Seed Center. Muak-lek, Saraburi 18180, Thailand.
5. Owens JN, Sornsathapornkul P, Thangmitcharoen S. 2001. Studying flowering and seed ontogeny in tropical forest trees. ASEAN-Canada Forest Tree Seed Center. Muak-lek, Saraburi 18180, Thailand, 2001.

23. KTDS22814 Advanced Silviculture, 2 credits

Lecturers: Prof. Dr. Ir. Suryo Hardiwinoto, Dr. Ir. Widiyatno

Description:

The Intensive Silviculture course studies various factors of tree growth both genetic and environmental factors intensively. Genetic factors discuss various tests to obtain superior species and seedlings, ranging from species tests, origin tests, offspring tests, and clone tests. Superior seedlings planted in the most suitable growing environment will be able to provide the best growth performance.

Silviculture-testing is a test of planting superior seedlings in various growing environment conditions and silvicultural treatments so that the best synergy can be obtained for the growth of superior trees in a planting location. Aspects of the growing environment studied. The presence of water factors (rainfall, humidity), soil conditions, sunlight (light intensity, temperature), and silvicultural measures. This course also discusses various results of intensive silviculture research that have been published in proceedings, national and international scientific journals.

Library:

1. Nyland, R.D., 1996. *Silviculture, Concepts and Applications*. The McGraw-Hill Companies, Inc, New York,
2. Smith, D.M., Bruce C.L., Matthew, J.K. and P.M.S. Ashton, 1997. *The Practice of Silviculture Applied Forest Ecology*. Ninth Edition. John Wiley and Sons, Inc, New York

24. KTD22801 Wood and Resin Relationship, 2 credits

Lecturers: Prof. Dr. Ir. Tibertius Agus Prayitno, Dr. Ir. Muhammad Navis Rofii

Description:

The Wood and Resin Relationship course discusses the various interactions between resins and wood, either resins that are inside the wood (internal resins) or resins that come from outside the wood (external resins). This course studies the properties of internal resins and their suitability for wood as adhesives, fillers or cell wall modifiers as well as their influence in wood processing. The properties of external resins both synthetic and natural as adhesives, coating materials and wood modifications.

Library:

1. Pizzi, A., K.L. Mittal. 2003. *Handbook of Adhesive Technology*. Marcel Dekker Inc, Taylor and Francis Group, New York-Basel. 999p.Hill, C.A.S. 2006.
2. Rowell, R.M. (ed). 2005. *Handbook of Wood Chemistry and Wood Composites*. CRC Press. Boca Raton. 487p.
3. Shmulsky, R., P.D. Jones. 2011. *Forest Products and Wood Science, An Introduction*, 6th ed, John Wiley & Sons, Chicester, UK. 496p.
4. Frihart, C.R., C.G. Hunt. 2021. *Wood Adhesives, Bond Formation and Performance*, in *Wood Handbook: Wood as an Engineering Material*, Ch. 10. Forest Products Laboratory, Madison. 543p.

25. KTDT22802 Wood Fiber Forensics, 2 credits

Lecturers: Dr. Ir. Fanny Hidayati, Prof(ret). SN Marsoem

Description:

Definition of biomass fibers and how to identify fibers. Various kinds of fibers, hardwood (broadleaf) and softwood (needle-leaf) fibers, non-wood fibers, grass fibers, bast fibers, foliage fibers, fruit fibers. Benefits and uses of fibers.

Library:

1. Forest Products and Wood Science: An Introduction, 7th Edition. Rubin Shmulsky and P. David Jones ISBN: 978-1-119-42643-1 March 2019. Wiley-Blackwell
504 Pages.
2. Fiber Atlas. Identification of Papermaking Fibers. Marja-Sisko Ilvessalo-Plaffli
3. Identification of the timbers of Southeast Asia and the Western Pacific Ken Ogata, Tomoyuki Fujii, Hisashi Abe. De Gruyter November 6, 2008

26. KTDT22803 Biomaterials Science and Engineering, 2 credits

Lecturers: Prof. Dr. Ir. Ragil Widyorini, Dr. Ir. Tomy Listyanto

Description:

Wood as a bio-material, ultra-structure and cell wall structure of wood, water content and dimensional instability, wood engineering or modification of wood plasticizing and bending, chemical modification by resin treatment (impregnation and compregnation), heat treatment or modification, wood-polymer composites, wood gluing utilizing chemical components in wood and cellulose nano composite, engineering properties and functional biomaterials through pyrolysis technology.

Library:

1. David N.S. Hon and N. Shiraishi. 2001. Wood and Cellulosic Chemistry. Second edition. Marcl Dekker,

- Inc. New York.
2. Callum A.S. Hill. 2006. Wood Modification: Chemical, Thermal and Other Processes. John Wiley & Sons, Ltd.
 3. Rowell R, M. 2005. Handbook of Wood Chemistry and Wood Composites. Taylor & Francis. CRC Press.
 4. Kumar, R. 2014. Polymer-Matrix Composites: Types, Applications and Performance. Nova Publisher. New York.
 5. White, R.J. 2015. Porous Carbon Materials from Sustainable Precursors. Royal Society of Chemistry. UK.

27. KTDT22804 Pre-treatment Technology of Lignocellulosic Materials, 2 credits

Lecturers: Dr. Ir. Denny Irawati, Dr.Ir. Johannes Pramana
Gentur Sutapa

Description:

This course studies the definition of pretreatment, the importance of pretreatment in processing biomass for energy and chemistry. Definition of structure, chemical composition, accessibility, and effect of pretreatment on lignocellulosic materials. Energy consumption for biomass pretreatment and pretreatment energy efficiency. Mechanism and technology biomass pretreatment (biological pretreatment, high temperature with hot steam, microwave, hot water, chemical pretreatment, organosol pre-treatment, ionic liquids). Potential inhibitors of the pretreatment process. As well as fractionation, chemical characteristics and structure of lignocellulosic matter after pretreatment process.

Library:

1. Zhen Fang. 2013. Pretreatment Techniques for Biofuels and Biorefineries. Springer-Verlag. Berlin
2. Charles E. Wyman. 2013. Aqueous Pretreatment of Plant Biomass for Biological and Chemical Conversion to Fuels and Chemicals. John Wiley and Sons. West Sussex.
3. Demirbas, A., 2010. Biorefinery: For biomass upgrading facilities. Springer. New York.
4. Zhu, J.Y., Pan, X. and Zalesny, R.S., 2010. Pretreatment

of woody biomass for biofuel production: energy efficiency, technologies, and recalcitrance. *Applied microbiology and biotechnology*, 87, pp.847-857.

5. Rajendran, K., Drielak, E., Sudarshan Varma, V., Muthusamy, S. and Kumar, G., 2018. Updates on the pretreatment of lignocellulosic feedstocks for bioenergy production-a review. *Biomass conversion and biorefinery*, 8, pp.471-483.

28. **KTDT22805 Essential Oil Bioactivity, 2 credits**

Teachers: Dr. Ir. Rini Pujiarti, Dr. Ir. Sigit Sunarta, Prof. Dr. Ir. Ganis Lukmandaru

Description:

This course discusses the history and development of essential oils, essential oil biosynthesis, chemical testing of essential oils (GC-MS analysis), chemical composition of essential oils, understanding and bioactivity of essential oils (antioxidant, anti-fungal, anti-insect, anti-inflammatory, anti-microbial, and aromatherapy), bioactivity analysis and biochemical mechanisms of essential oils of forestry plants.

Library:

1. Baser, K.C.B., G. Buchbauer. 2010. *Handbook of Essential Oil, Science, Technology and Application*. CRC Press, London, New York.
2. Berger, R.G. 2007. *Flavors and Fragrances: Chemistry, Bioprocessing and Sustainability*. Springer Berlin Heidenberg, New York.
3. Guenther, E. 2007. *The Essential Oils. Vol.1: History-Origin in Plant- Production-Analysis*. Jepson Press.
4. Sell, C.S. 2003. *A Fragrant Introduction to Terpenoid Chemistry*. The Royal Society of Chemistry, Cambridge, UK.
5. Tisserand, R., and Young, R. 2013. *Essential Oil Safety*. Churhill Livingstone, Elsevier.
6. White, G.L. 2013. *Essential Oil and Aromatherapy*. White Willow Books.

29. KTD22806 Wood Structure and Environment, 2 credits

Lecturers: Dr. Ir. Widyanto Dwi Nugroho

Description:

This course discusses the response of wood to environmental changes, wood growth and structure, the relationship between climate and wood formation systems, the influence of ecological genetic factors on wood structure, and modification of wood structure due to aging, extreme site conditions, gravitropism, and attack by wood destroying agents. The discussion of the concept of wood response to environmental changes will be complemented by knowledge of the preparation of wood samples for microscopic analysis.

Library:

1. Richer C. 2015. Wood Characteristics: Description, Causes, Prevention, Impact on Use and Technological Adaptation. Springer Cham Heidelberg New York Dordrecht London.
2. Schweingruber, F.H. 2007. Wood Structure and Environment. Springer-Verlag Berlin Heidelberg.
3. Ahmad P., Wani M.R. (eds). 2014. Physiological Mechanisms and Adaptation Strategies in Plants Under Changing Environment. Vol 1. Springer New York Heidelberg Dordrecht London.
4. Fritts, H.C. 2001. Tree Rings and Climate. The Blackburn Press. New Jersey. USA.
5. AWA Committee. 1989. IAWA List of Microscopic Features for Hardwood Identification. Wheeler E.A., Baas P., Gasson P.E. (Eds.). International Association of Wood Anatomists.

30. KTD22807 Wood Adhesive Chemistry and its Applications, 2 credits

Lecturers: Prof. Dr. Ir. Ragil Widyorini, Prof. Dr. Ir. Ganis Lukmandaru

Description:

General theory of adhesion, modification and chemical mechanism of adhesion (thermosetting adhesives, thermoplastic adhesives, natural adhesives, lignin-based

adhesives, starch-based adhesives, soy-based adhesives), chemical degradation process of wood (lignin, hemicellulose, cellulose), analysis method of adhesion reaction, mechanism of adhesion reaction, factors affecting adhesion mechanism.

Library:

1. Kumar, R. 2014. Polymer-Matrix Composites: Types, Applications and Performance. Nova Publisher. New York.
2. Mohanty AK, Misra M, Drzal LT (eds). 2005. Natural Fibers, Biopolymers, and Biocomposites. CRC Press. USA.
3. Pizzi, A. and Mittal, KL. (eds). 2003. Handbook of Adhesive Technology. Marcel Dekker Inc, New York.
4. Rowell R (ed). 2005. Handbook of Wood Chemistry and Wood Composite. CRC Press. Florida.

31. KTDT22808 Fundamental Aspects of Tropical Wood Drying, 2 credits

Lecturers: Tomy listyanto, Ph.D., Dr. Yustinus Suranto

Description:

Tropical wood drying science and technology including characteristics of tropical wood, basic properties of wood related to drying process, fundamental principles of wood drying, oven design, preparation of drying schedules for broadleaf and needle leaf wood, stresses in wood during drying, development of drying schedules, modern drying processes, wood drying research and wood drying practices in the wood processing industry.

Library:

1. Antti, A. (1992). Microwave drying of hardwood: simultaneous measurements of pressure, temperature and weight reduction. Forest Products Journal42, 49-54.
2. Avramidis, S., and Zwick, R. L. (1992). Exploratory radio-frequency/vacuum drying of three B. C. coastal softwoods. Forest Product Journal48, 17-24.

3. Kuebler, H. (1960). "Drying Stresses and stress relief in thin sections of wood." Forest Products Laboratory, USDA, Wisconsin.
4. Langrish, T., and Walker, J. C. F. (2006). Drying of Timber.59In "Wood Primary Processing" (J. C. F. Walker, ed.). Springer, Dordrecht.
5. Lessard, R. A., and Hill, J. (1998). Controlling stress during drying to produce top-quality lumber. Wood Technology125, 32.

32. KTD22809 Eco-friendly Wood Preservation Science and Technology, 2 credits

Lecturers: Dr. Ir. Yustinus Suranto, Dr. Ir. Tomy Listyanto

Description:

Identify and analyze the durability of tropical timber. The calculation of preservative solution concentration required in the context of cell structure, effectiveness of preservation system, high temperature modification, pollution control of preservation process, research design in the field of wood preservation.

Library:

1. Archer, K., and Lebow, S. (2006). Wood Preservation. In "Wood Primary Processing" (J. C. F. Walker, ed.). Springer, Dordrecht, The Netherlands.
2. Daniel, G and Nilsson, T. 1985. Ultrastructural and TEM-Edax studies on the degradation of CCA treated Radiata Pine by tunnelling Bacteria. IRG secretariat, Stockholm.
3. Gentz, M. C., and Grace, J. K. (2006). A review of boron toxicity in insects with an emphasis on termites. Journal of Agricultural and Urban Entomology23, 201-207.
4. Henningson, B. and Norman, E. 1980. Marine Borer Test with Water Borne Preservative. IRG secretariat, Stockholm.
5. Nicholass, D. D. and Cote, W. A. 1988. Deterioration of Wood and its Prevention by Preservation treatments. Volume II. Translator R. Joedodibroto. Airlangga Press Surabaya.

33. **KTDT22810 Tropical Wood Ultrastructure, 2 credits**

Lecturers: Dr. Ir. Widyanto Dwi Nugroho

Description:

This course discusses the structure of wood observed in more detail using methods and tools capable of observing the ultrastructure of wood. In this course, wood microscopy techniques, observation methods with transmission electron microscope, scanning electron microscope, confocal laser scanning microscope and fluorescence microscope will be studied.

The structure of wood and changes in wood structure due to environmental influences and wood processing will be studied by ultrastructural observation of wood cells.

Library:

1. Fengel D., Wegener G. 1995. Wood: Chemistry, Ultrastructure, Reactions (Indonesian Edition). Gadjah Mada University Press. Bulaksumur, Yogyakarta. Indonesia.
2. Kim Y.S., Funada R., Singh A.P. 2016. Secondary Xylem Biology: Origin, Function and Applications. Elsevier.
3. Chaffey N. (ed.). 2004. Wood Formation in Trees: Cell and Molecular Biology Techniques. Taylor and Francis. London and New York.
4. IAWA Committee. 1989. IAWA List of Microscopic Features for Hardwood Identification. Wheeler E.A., Baas P., Gasson P.E. (Eds.). International Association of Wood Anatomists.

34. **KTDT22811 Wood Extractives and Colors, 2 credits**

Lecturers: Prof. Dr. Ganis Lukmandaru, Dr. Ir. Rini Pujiarti

Description:

Discusses aspects of color in wood which include: (1) color measurement, (2) formation of pigments, phenolic compounds, heartwood and wood coloring, (3) changes in wood color due to light, iron, acid, alkali, microorganisms, enzymes, and non-microbial oxidation factors, and (4) their application in wood products as dyes (raw material sources, pigment chemical properties, color properties).

Library:

1. Harborne, J.B. and B.L. Turner. 1984. Plant Chemosystematics. London: Academic Press.
2. Hon, D.N.S., N. Shiraishi (eds). 2001. Wood and Cellulosic Chemistry. Marcel Dekker, New York.
3. Rowell, R.M (ed). 1984. The chemistry of solid wood. American Chemical Society, Seattle, Washington.

35. KTDT22812 Wood Vinegar Science and Technology, 2 credits

Lecturers: Dr. Ir. Sigit Sunarta, Prof. Dr. Ir. Ganis Lukmandaru

Description:

This course discusses wood vinegar which includes definition, raw materials, pyrolysis methods, chemical components, fractionation techniques, purification, benefits and quality standards. Utilization of wood vinegar includes bioactive components, antioxidants, and seed growth promoting agents.

Library:

1. Hon, D.N.S., N. Shiraishi (eds). 2001. Wood and Cellulosic Chemistry. Marcel Dekker, New York.
2. Houghton, P; Rahman, A. 1998. Laboratory Handbook for the Fractionation of Natural Extracts. Chapman- Hall
3. Klass, DL. 2006. Biomass for Renewable Energy, Fuels, and Chemicals. Elsevier

36. KTDT22813 Tropical Wood Machining Technology, 2cr

Lecturerr: Dr. Ir. Tomy Listyanto, Prof. Dr. Ir. Ganis Lukmandaru

Description:

This course discusses (1) Tropical wood machining in the solid wood industry (2) The relationship between wood properties and wood machining quality (3) Analysis of wood machining processes in orthogonal cutting (4) Analysis of wood machining processes in peripheral cutting (5) Wood work-oriented wood machining operations: planing, shaping,

turning, bolting, drilling, sanding, so that the results of the planing provide high quality to wood workpieces, and (6) Direction of production forest management. based wood machining.

Library:

1. Csanady, E., and Magoss, E., 2013. Mechanics of Wood Machining. Second Edition. Department of Wood Engineering. University of West Hungary, Sopron, Springer-Verlag, Heidelberg Berlin. New York.
2. Koch, P., 1964. Wood Machining Processes. The Ronald Press Company. New York.
3. Kollmann, F.P.P., and Cote, W.A., 1968. Principel of Wood Science and Technology. Volume I. Springer-Vetlag. New York.
4. Vlasov, G. D., V. A. Kislikov and S. V. Rodionov. 1968. Technology of Wood Working. Higher School Publishing House. Moscow.

37. KTDK22801 Land Conservation and Rehabilitation, 2 credits

Lecturere: Dr. Ir. Ambar Kusumandari and Dr. Ir. Hatma Suryatmojo

Description:

The course "Land Conservation and Rehabilitation" contains discussions on land, critical land, forest land degradation and factors affecting land degradation. Furthermore, it also discusses the activities of various sectors that overlap with forest utilization. Finally, it discusses how to select land for rehabilitation using the CASM method, conservation and rehabilitation of degraded land to achieve sustainable forest development.

Library:

1. Arsyad, S. 2010. Soil and Water Conservation. Bogor Agricultural University (IPB) Press. Bogor.
2. Asdak, C. 2010. Hydrology and Watershed Management. Gadjah Mada University Press. Yogyakarta.
3. FAO. 2011. Assessing Forest degradation towards the

- development of globally applicable guidelines. Forest Resources Assessment Working Paper 177. Rome, Italy.
4. Sayer, J and Maginnis, S. 2005. Forests in Landscapes Ecosystem approaches to sustainability. Earthscan. London.

38. KTDK22802 Conservation Area Restoration, 2 credits

Lecturers: Dr. Ir. Hatma Suryatmojo, Dr. Ir. Lies Rahayu Wijayanti Faida, Dr. Ir. Hero Marhaento, Dr. Ir. Sena Adi Subrata

Description:

Discusses the understanding of the concepts of conservation area restoration (understanding of ecological restoration and conservation areas, the importance of conservation area restoration, restoration considerations in the spatial and temporal dimensions, restoration of conservation areas in the context of climate change (resilience-adaptation theory, and mitigation, restoration of connectivity/corridors between conservation areas); processes of conservation area restoration (problem identification and stakeholder engagement, problem analysis, creation of ecological restoration objectives, design of restoration approaches, implementation of ecological restoration, implementation of adaptive management); principles of conservation ecology (restoration and ecosystem integrity, effectiveness of restoring conservation areas, efficiency of conservation area restoration, stakeholder collaboration and community participation for conservation area restoration); and case studies of conservation area restoration in various countries.

Library:

1. Karen Keenleyside, Nigel Dudley, Stephanie Cairns, Carol Hall, Sue Stolton. Restoration for Protected Areas: Principles, Guidelines, and Best Practices. The IUCN WCPA Ecological Restoration Taskforce. Best Practice Protected Area Guidelines Series No. 18.
2. Dominick A. DellaSala, Anne Martin, Randi Spivak,

- Todd Schulke, Bryan Bird, Marnie Criley, Chris van Daalen, Jake Kreilick, Rick Brown, and Greg Aplet, 2003, A Citizen's Call for Ecological Forest Restoration: Forest Restoration Principles and Criteria. Ecological Restoration, Vol. 21, No. 1, 2003 ISSN 1522-4740 ©2003 by the Board of Regents of the United States, the University of Wisconsin System.
3. Michael L. Morrison, 2002, Wildlife Restoration: Techniques for
 4. Habitat Analysis and Animal Monitoring. Society for Ecological Restoration, Island Press Washington, Covelo, London.
 5. Philip Roni, Timothy J. Beechie, Robert E. Bilby, Frank E. Leonetti, Michael M. Pollock & George R. Pess (2002) A Review of Stream Restoration Techniques and a Hierarchical Strategy for Prioritizing Restoration in Pacific Northwest Watersheds, North American Journal of Fisheries Management, 22:1,1-20, DOI: 10.1577/1548-8675(2002)022<0001:AROSRT>2.0.CO;2. To link to this article: [http://dx.doi.org/10.1577/15488675\(2002\)022<0001:AROSRT>2.0.CO;2](http://dx.doi.org/10.1577/15488675(2002)022<0001:AROSRT>2.0.CO;2).

39. KTDK22803 Conservation of Natural Resources and Environment, 2 cr

Lecturers: Prof. Dr. Ir. Djoko Marsono, Dr. Ir. Hatma Suryatmojo

Description:

Learn about components, types and characteristics natural resources and the environment in relation to humanlife and other living things and efforts to maintain thepreservation and conservation of the ability of natural resources and the environment itself.

Library:

1. Owen, OS. 1985. Natural Resource Conservation. An Ecological Approach. Fourth Edition. Macmillan Publishing Company New York

40. KTDK22804 Tropical Hydrology, 2 credits

Lecturers: Dr. Ir. Hatma Suryatmojo and Dr. Ir. Ambar Kusumandari

Description:

Tropical Hydrology is an important basis in science related to water resources. This course discusses basic topics in hydrology and water resources which are then continued with special topics related to the relationship between forests and water resources. The study of concepts, processes, basic principles and analysis in hydrological systems in the tropics is discussed in more detail. Sections 1-4 discuss the basic concepts and principles of hydrology, water resources and tropical forests. Sections 5-9 discuss the characteristics of tropical forest ecosystems related to the water cycle, rainfall, evaporation, water flow, flooding, sediment movement and stream habitat. Sections 10-12 discuss various cases and research related to the influence of tropical forests on water resources as a link between forests and water. The final section also provides details on water quality and quantity.

Library

1. Chang, M., 2006. Forest Hydrology. CRC Press, NY.
2. Allen, P.A and Allen, J.R., 2005. Basin Analysis: Principles and Applications. Blackwell Publishing, UK.
3. Montagnini, F & Jordan, C.F., Tropical Forest Ecology. Springer, The Netherlands.
4. Dudgeon, D., 2008. Tropical Stream Ecology. Elsevier, The Netherlands.
5. Haan, C.T., Barfield, B.J. and Hayes, J.C. 1994. Design Hydrology and Sedimentology for Small Catchments. Academic Press, California.

41. KTDK22805 Quantitative Ecology, 2 credits

Lecturers: Prof. Dr. Ir. Erny Poedjirahajoe, Prof. Dr. Ir. Djoko Marsono

Description:

This course learns how to quantitatively describe patterns and relationships between ecosystem components between

fellow living things and their environment. The quantitative approach is based on statistical and mathematical rules. Topics include spatial distribution, vegetation sampling techniques, community classification, Community Coefficient Cluster Model Classification, ordination model, Cluster Analysis, Single Linkage Clustering, Complete Linkage Clustering and Discriminant analysis, Analytical Hierarchy Process.

Library:

1. Ludwig, John A and James F Reynolds. 1988. Statistical Ecology. A Wiley Interscience Publication. John Wiley and Sons. New York.
2. Mueller-Dombois, D. and Ellenberg, H. 1974. Aims and Methods of Vegetation Ecology. John Wiley and Sons, New York.
3. Newton, A. 2007. Forest Ecology and Conservation. A Handbook of Techniques. Oxford University.

42. KTDK 22806 Evaluation of Conservation Area Management, 2 credits

Lecturers: Dr. Ir. Taufik Tri Hermawan, Dr. Ir. Hero Marhaento

Description:

This course provides knowledge of both science (theory). The course provides students with the knowledge and skills to become experts in conservation area management in accordance with the development of existing science. The discussion is directed at the ideal context of conservation area management theoretically, the condition of gaps in conservation area management which includes gaps in representation, ecology and management, and how to fulfill these gaps. The scope of this course includes a variety of conservation areas both managed by the state and the private sector, characteristics of various conservation areas, conservation area gaps (representation, ecology and management) as well as area conservation strategies, various supporting theories in conservation area management, preparation of criteria for conservation area management and evaluation indicators for protected and conservation area management, and an understanding of Spatial Multi Criteria Analysis (SMCA) tools.

Library:

1. Hockings, M., Leverington, F., & Cook, C. (2015). Protected area management effectiveness. *Protected area governance and management*, 889-928.
2. Hockings, M. (2000). Evaluating protected area management: a review of systems for assessing management effectiveness of protected areas. *Occasional Paper-School of Natural and Rural Systems Management, University of Queensland*, 7(3).
3. Leverington, F., Costa, K. L., Pavese, H., Lisle, A., & Hockings, M. (2010). A global analysis of protected area management
4. MacArthur, R. H., & Wilson, E. O. (2016). The theory of island biogeography. In *The Theory of Island Biogeography*. Princeton university press.

43. KTDK22807 Advanced Ecosystem Ecology, 2 credits

Lecturers: Prof. Dr. Ir. Erny Poedjirahajoe, Prof. Dr. Ir. DjokoMarsono

Description:

The subject matter of this course is about the characteristics of forest ecosystems, starting from the components of the ecosystem, classification, diversity, energy in the ecosystem, homeostasis, material cycles, nutrient cycles, nutrient balance and forest stability as the basis for management.

Library:

1. Chapin III, FS; PA Matson; and HA Mooney. 2002. *Principles of terrestrial ecosystem ecology*. Springer-Verlag.
2. Likens GE; FH Bormann; RS Pierce; JS Eaton; and NM Johnson. 1977. *Biogeochemistry of a Forested Ecosystem*. Springer Verlag. NY.

44. KTDK22808 Genetic Biodiversity Conservation, 2 cr

Lecturers: Dr. Ir. Sena Adi Subrata, Dr. Ir. Taufik Tri Hermawan

Description:

Definition of biodiversity and conservation biology; species-level biodiversity; ecosystem-level biodiversity; genetic-level biodiversity; processes of biodiversity change; molecular approaches to biodiversity studies; case study: agricultural development affects genetic diversity of greater mandarins.

Library:

1. Malcolm L Hunter, Jr. and James P Gibbs, 2007. Fundamentals of Conservation Biology. Blackwell Publishing. USA. Chapter 1, 2, 3, 4, 5.
2. Navjot S Sodhi and Paul R Ehrlich, 2010. Conservation biology for all. Oxford University Press. UK. Chapter 2 and 5.
3. Fred W Allendorf, Gordon Luikart, and Sally N Aitken, 2013. Conservation and the Genetics of Populations. Wiley-Blackwell. UK. Chapters 3, 4, 13, 15, 16.
4. Joanna R Freeland, Heather Kirk and Stephen Peterson, 2011. Molecular Ecology. 2nd Edition. Wiley-Blackwell. UK. Chapter 3, 4.

45. KTDK22810 Advanced Aquatic Ecology, 2 credits

Lecturers: Prof. Dr. Ir. Erny Poedjirahajoe, Dr. Ir. Ni Putu Diana Mahayani

Description:

This course emphasizes efforts to conserve aquatic ecosystems that include areas that are always inundated with water, including marine waters. This ecosystem is unique, because it is a life support, in which there is a water cycle, soil cycle and various flora, fauna and human life with its diversity. This course contains / discusses the coastal forest ecosystem, reefs corals, seagrass beds, mangroves and swamps, all of which are ecologically interrelated. Conservation techniques through a detailed understanding of

each aquatic ecosystem is the goal of this course.

Library:

1. Mann, KH. 1982. Ecology of Coastal Waters. Boston Melbourne.
2. Koch, E. W. 2001. Beyond light: Physical, biological, and geochemical parameters as Possible submersed aquatic vegetation habitat requirements.
3. Smith, J., 1982 *Biology of Coral Reefs*. London, Sidney, Toronto.
4. Johan, E.T., 1984, *Ecology of Peatswamp Forest*. John Wiley & Sons Publisher.

46. KTDK22811 Advanced Wildlife Management, 2 credits

Lecturers: Prof. Dr. Ir. Satyawan Pudyatmoko, Dr. Ir. Moh. AliImron

Description:

This course will cover the theories and concepts of wildlife ecology and the research methodologies used in it. One of the intrinsic difficulties in wildlife research is weaknesses in research methods. The quality of research methodology is often limited by logistical and environmental issues that cannot always be controlled by the researcher and the very limited number of samples or observations and other issues that can weaken the validity of research results and concepts to be built. Research methods and results in wildlife ecology are often used as a reference in conservation management, and the consequences of using the wrong methods can lead to mistakes in conservation management actions.

The purpose of this course is to present examples of major issues and research techniques, identify limitations and errors in the use of methods, present possible solutions, and provide an overview of the major issues and research techniques. New perspectives on how to interpret data from different areas of study or research. This course is a critical review of methodologies used in wildlife research.

Library:

1. Research Techniques in Animal Ecology: controversies and consequences (2000). Editors: Luigi Boitani and Todd K. Fuller.

47. **KTDK22812 Wetland/Brackish Ecology, 2 credits**

Lecturers: Prof. Dr. Ir. Erny Poedjirahajoe, Dr. Munasik, M.Sc.

Description:

Wetlands require integrated management between ecosystems and between their constituent components. This course focuses on the interrelationships between ecosystems and ecosystem components, the influence of habitat, distribution and productivity, material and energy cycles. Designing conservation efforts by proposing solutions if there is a disturbance to the ecosystem, as well as a mathematical solution model.

Library:

1. Alongi D.M. 2009. The Energetics of Mangrove Forests. Springer Science Business Media BV.
2. Mann. KH. 1982. Ecology of Coastal Waters. Boston Melbourne.
3. Ludwig and Reynold. 1988. Statistical Ecology. John Wiley & Sons Publisher.