Outcome-based Curriculum of Bachelor of Science (Honours) in Forestry

Forestry and Wood Technology Discipline

Khulna University

June 2022

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OUTCOME-BASED CURRICULUM

PART- A

01. Title of the Academic Program

Bachelor of Science (Honours) in Forestry

Program Overview	
Degree	Bachelor of Science (Honours) in Forestry
Abbreviated form of the Degree	B. Sc. (Hon's.) in Forestry
Discipline/Program Offering Entity (POE)	Forestry and Wood Technology Discipline
School	Life Science School
Awarding Institution	Khulna University
Location	Khulna, Bangladesh
Bangladesh National Qualifications Framework (BNQF) Level	7
International Standard Classification of Education (ISCED) Code	0821
Mode of Study	Full Time
Language of Study	English
Applicable Session	2021-22 and onwards

02. Name of the University

Khulna University

03. Vision of the University

Creation of global leaders who will contribute to make knowledge-based just society through accelerating inclusive and transformative growth of Bangladesh and the world. The university aims to achieve this vision through scholarly enquiry and contribution to the global knowledge pool.

04. Mission of the University

UM no.	Mission Statements
UM1	Explore human potential to the fullest extent and produce self-motivated, aspiring leaders to work for the betterment of the humankind based on wisdom, freethinking, creativity and unhindered intellectual exercises.
UM2	Ensure a transformative educational experience that enables creative learning, entrepreneurship and inquisitiveness among the students.
UM3	Create an inclusive research environment that enables graduates to make demonstrable economic and social impacts through translating knowledge and innovation into practice driven by moral values and professional ethics.

UM = University Mission

05. Name of the Discipline/Program Offering Entity (POE)

Forestry and Wood Technology Discipline

06. Vision of the Discipline/POE

Becoming the center of excellence in teaching and research in the field of forestry and wood science nationally and globally for 21st century.

07. Mission of the Discipline/POE

Mission no.	Mission Statements
M1	To provide quality education in forestry and wood science
M2	To conduct state of the art research in the various fields of forestry and wood science
M3	To produce quality forestry professionals with cutting-edge knowledge and skills capable of serving national- and global-forestry relevant sectors

M = Mission of the Discipline/POE

08. Objectives of the Discipline/POE

The objectives of Forestry and Wood Technology discipline include conducting education and research in the field of forest science and wood technology through various programs, such as Bachelor, Masters and PhD, which will contribute to the sustainable management, conservation, utilization and governance of forest and forest resources.

Objective no.	Objective Statements
O1	To produce professionals with state-of-the-art knowledge and skill fit for fulfilling national and global demand for forest sector of 21st century
O2	To enhance the intellectual ability, creative & practical skills to the learner require for sustainable management, conservation, utilization and governance of forest and forest resources
O3	To conduct advance research in the field of forestry and wood science for knowledge generation
O4	To carry out need based research, consultancy services and technology development with outreach activities and technology transfer
O5	To contribute in countries natural resource management and development in respect of SDGs and 4th industrial revolution through research, information generation.
O6	To create awareness among the public and policy makers regarding concurrent forest sector issues

O = Objective of the Discipline/POE

09. Name of the Degree:

Bachelor of Science (Honours) in Forestry

10. Description of the Program

The curriculum of the bachelor program has been designed to fulfill the needs of forestry sector of Bangladesh and the world. Considering the close proximity to the Sundarbans, the largest single tract mangrove forests of the world, which accounts for 40% of the state-owned forest in Bangladesh, many courses of the program focus on the mangrove ecology, conservation and management. The program also emphasizes various social forestry and forestry extension courses in the scenario of forest deficient northern region of the country where the government has been implementing various forestry extension and social forestry programs. In order to reduce exploitation pressure on forest resources and enhance forest conservation, the use of solid wood, such as particle board, ply wood, fiberboard and various types of processed wood are useful alternatives. The program also covers a handful of courses on wood science in the context of rapid industrialization in the wood sector in Bangladesh and in the world. The courses give emphasis in achieving the optimum utilization of forest produce in order to reduce the gap between demand and supply of forest produce in Bangladesh and contribute to forest conservation. The program is specially designed to produce competent professionals who are able to think critically and lead in forest resource management and development in respect of SDGs and 4th industrial revolution through research, information generation. So far, FWT Discipline has produced a large number of forestry graduates, who have already acquired fame in professional arenas as well as in non-professional job markets. The graduates are competent to meet the future challenges of forestry and environmental issues of the country and the globe as a whole.

11. Graduate Attributes

GA no.	Graduate Attributes	Domain
GA1	Deep discipline knowledge	Fundamental domain
GA2	Critical thinking, problem solving and decision making skills	Thinking domain
GA3	Digital capabilities	Personal domain
GA4	Professionalism	Personal domain
GA5	Ethical competency	Social domain
GA6	Teamwork and communication skills	Social domain
GA7	Lifelong learning skills and self-awareness	Personal domain

GA = Graduate Attributes

12. Program Educational Objectives (PEOs)

PEO no.	PEO Statements	Domain
PEO1	To provide need oriented education and research opportunities to the students so that students can conceptualize the basic concepts, theories, principles, processes and procedures of the core areas of Forestry and Wood Science	Fundamental domain
PEO2	To prepare the students so that they can demonstrate high level analytical and critical thinking skills to solve emerging problems in forestry sector and wood based industries.	Thinking domain
PEO3	To prepare the students for scientific investigation, personal integrity and to realize the roles of forestry graduates on industrial, social and economic aspects nationally and globally.	Personal domain
PEO4	To introduce students with moral and ethical values, and good practices to handle the research findings.	Social domain

13. Program Learning Outcomes (PLOs)

After successful completion of the degree, the learner will be able to:

A. Fundamental Skills	
PLO1	Keep up-to-date with the forestry sector’s state of the art knowledge.
PLO2	Apply theoretical knowledge of forestry and wood science in practice.
PLO3	Display advanced digital literacy to perform complex tasks and design independent field operational plan.
B. Social Skills	
PLO4	Communicate, express and interact effectively for social, academic and professional purposes.
PLO5	Demonstrate moral values, ethics, professionalism and leadership.
C. Thinking Skills	
PLO6	Analyze forestry sector problems and find out appropriate mitigation strategies with a multidisciplinary approach.
PLO7	Demonstrate professional knowledge and practical skills in both technical and management to lead a team.
D. Personal Skills	
PLO8	Adapt to the professional environment and improve skills according to the changing environment.
PLO9	Show competencies to fulfil employment, entrepreneurial and lifelong learning skills

PLO = Program Learning Outcome

14. Mapping Mission of the University with PEOs

Mission / PEO	UM1	UM2	UM3
PEO1	3	2	1
PEO2	3	2	1
PEO3	1	2	3
PEO4	1	2	3

Level of Association: 3-High, 2-Medium, 1-Low

15. Mapping PLOs with PEOs

Program Learning Outcomes (PLOs)		Program Educational Objectives (PEOs)			
		PEO1	PEO2	PEO3	PEO4
A. Fundamental Domain	PLO1	●	●		
	PLO2	●	●		
	PLO3		●	●	
B. Social Domain	PLO4			●	●
	PLO5		●	●	●
C. Thinking Domain	PLO6	●	●		
	PLO7		●	●	●
D. Personal Domain	PLO8			●	●
	PLO9		●	●	●

16. Mapping Courses with PLOs

Course Code and Course Title	PLOs								
	Fundamental Domain			Social Domain		Thinking Domain		Personal Domain	
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
First Year First Term									
0821 05 FWT 1101 Introduction to Forestry	●	●							●
0821 05 FWT 1102 Introduction to Forestry Sessional/Fieldwork	●	●							●
0821 05 FWT 1103 Forest Botany and Dendrology	●	●							●
0821 05 FWT 1104 Forest Botany and Dendrology Sessional/Fieldwork	●	●							●
0821 05 FWT 1105 Wood Structure and Properties	●	●							●
0821 05 FWT 1106 Wood Structure and Properties Sessional	●	●							●
0531 05 Chem 1151* Chemistry	●	●	●						
0531 05 Chem 1152* Chemistry Sessional	●	●	●						
0533 05 Phy 1153* Physics	●	●	●						
0533 05 Phy 1154* Physics Sessional	●	●	●						
0231 05 Eng 1155 Functional and Communicative English				●	●			●	●
0613 05 CSE 1156 Computer Applications in Forestry Sessional-I			●						●

First Year Second Term									
0821 05 FWT 1201 Forest Tree Physiology	●	●							
0821 05 FWT 1202 Forest Tree Physiology Sessional/Fieldwork	●	●							
0511 05 FWT 1203* Zoology	●	●							
0821 05 FWT 1205 Wood Physics and Mechanics	●	●							●
0821 05 FWT 1206 Wood Physics and Mechanics Sessional	●	●							●
0532 05 FWT 1207 Geology and Soil Science	●	●							
0532 05 FWT 1208 Geology and Soil Science Sessional/Fieldwork	●	●							
0521 05 FWT 1209* Introduction to Environmental Science	●	●							
0521 05 FWT 1210* Introduction to Environmental Science Sessional/Fieldwork	●	●							
0541 05 Math 1251 Mathematics	●	●	●						
0314 05 Soc 1253 Sociology				●	●	●	●		●

Second Year First Term									
0821 05 FWT 2101 Forest Ecology	●	●							
0821 05 FWT 2102 Forest Ecology Sessional/ Fieldwork	●	●							
0821 05 FWT 2103 Forest Genetics and Tree Improvement	●	●							
0821 05 FWT 2104 Forest Genetics and Tree Improvement Sessional/Fieldwork	●	●							
0821 05 FWT 2105* Sawmilling, Saw doctoring and Wood Working	●	●							●
0821 05 FWT 2106* Sawmilling, Saw doctoring and Wood Working Sessional/Fieldwork	●	●							●
0821 05 FWT 2107 Non-wood Forest Products and Utilization	●	●							●
0821 05 FWT 2108 Non-wood Forest Products and Utilization Sessional/Fieldwork	●	●							●
0821 05 FWT 2109 Mycology and Forest Pathology	●	●							
0821 05 FWT 2110 Mycology and Forest Pathology Sessional/Fieldwork	●	●							
0732 05 CE 2151 Forest Surveying	●	●							●
0732 05 CE 2152 Forest Surveying Sessional	●	●							●
0613 05 CSE 2154* Computer Applications in Forestry Sessional -II			●						●

Second Year Second Term									
0821 05 FWT 2201 Species Silviculture and Silvicultural Practices	●	●							●
0821 05 FWT 2202 Species Silviculture and Silvicultural Practices Sessional/Fieldwork	●	●							●
0821 05 FWT 2203 Mangroves Ecology and Costal Afforestation	●	●							
0821 05 FWT 2204 Mangroves Ecology and Costal Afforestation Sessional/Fieldwork	●	●							
0821 05 FWT 2205 Wood Chemistry	●	●							
0821 05 FWT 2206 Wood Chemistry Sessional	●	●							
0716 05 FWT 2207 Aerial Photogrammetry and Remote Sensing	●	●						●	●
0716 05 FWT 2208 Aerial Photogrammetry and Remote Sensing Sessional/Fieldwork	●	●						●	●
0821 05 FWT 2209* Soil Conservation and Watershed Management	●	●							
0821 05 FWT 2210* Soil Conservation and Watershed Management Sessional/Fieldwork	●	●							
0542 05 Stat 2251 Statistics	●	●				●	●		●
0542 05 Stat 2252 Statistics Sessional	●	●				●	●		●

Third Year First Term									
0821 05 FWT 3101 Silvicultural Systems	●	●							●
0821 05 FWT 3102 Silvicultural Systems Sessional/Fieldwork	●	●							●
0821 05 FWT 3103 Forestry Extension and Community Organization	●	●		●	●				
0821 05 FWT 3104 Forestry Extension and Community Organization Sessional/Fieldwork	●	●		●	●				
0821 05 FWT 3105* Forest Entomology and Pest Management	●	●							
0821 05 FWT 3106* Forest Entomology and Pest Management Sessional/Fieldwork	●	●							
0821 05 FWT 3107 Forest Mensuration and Inventory	●	●	●			●	●	●	●
0821 05 FWT 3108 Forest Mensuration and Inventory Sessional/Fieldwork	●	●	●			●	●	●	●
0521 05 FWT 3109* Environmental Impact Assessment						●	●		●
0821 05 FWT 3111 Wood Seasoning and Preservation	●	●							●
0821 05 FWT 3112 Wood Seasoning and Preservation Sessional/Fieldwork	●	●							●
0821 05 FWT 3113 Forest Economics and Forest Product Marketing	●	●							●

Third Year Second Term									
0821 05 FWT 3201 Biocomposites and Adhesion Technology	●	●							●
0821 05 FWT 3202 Biocomposites and Adhesion Technology Sessional/Fieldwork	●	●							●
0821 05 FWT 3203 Forest Harvesting and Transportation Engineering	●	●							●
0821 05 FWT 3204 Forest Harvesting and Transportation Engineering Sessional/Fieldwork	●	●							●
0821 05 FWT 3205 Social Forestry and Rural Development		●		●	●	●			●
0821 05 FWT 3206 Social Forestry and Rural Development Sessional/Fieldwork		●		●	●	●			●
0111 05 FWT 3207 Research Methodology			●			●	●	●	●
0111 05 FWT 3208 Research Methodology Sessional/Fieldwork			●			●	●	●	●
0821 05 FWT 3209 Wildlife Management and Nature Based Tourism	●			●	●	●	●	●	●
0821 05 FWT 3210 Wildlife Management and Nature Based Tourism Sessional/Fieldwork	●					●	●	●	●
0720 05 FWT 3211* Rubber and Tea Science	●	●							●
0720 05 FWT 3212* Rubber and Tea Science Sessional/Fieldwork	●	●							●
0731 05 URP 3252* Geographic Information System Sessional	●	●	●			●	●		●

Fourth Year First Term									
0821 05 FWT 4101 Agroforestry and Farming System	●	●							●
0821 05 FWT 4102 Agroforestry and Farming System Sessional/Fieldwork	●	●							●
0821 05 FWT 4103 Forest Management	●	●	●			●	●	●	●
0821 05 FWT 4105* Forest Development Planning and Project Designing						●	●	●	●
0821 05 FWT 4106* Forest Development Planning and Project Designing Sessional						●	●	●	●
0821 05 FWT 4107 Pulp and Paper Technology	●	●							●
0821 05 FWT 4108 Pulp and Paper Technology Sessional/Fieldwork	●	●							●
0821 05 FWT 4109* Wood Modification and Properties Improvement	●	●							●
0821 05 FWT 4110* Wood Modification and Properties Improvement Sessional/Fieldwork	●	●							●
0821 05 FWT 4112 Viva voce				●	●	●	●	●	●
0821 05 FWT 4114 Thesis				●	●	●	●	●	●
0411 05 BA 4151* Accounting	●	●	●						●

Fourth Year Second Term									
0821 05 FWT 4201 Forest Policy and Governance	●	●				●	●	●	●
0821 05 FWT 4202 Forest Policy and Governance Sessional/Fieldwork	●	●				●	●	●	●
0821 05 FWT 4203 Forest Law and Administration	●	●		●	●			●	●
0821 05 FWT 4205 Mangrove Resources Management and Utilization	●	●							
0821 05 FWT 4207* Forest Biodiversity and Protected Area Management	●	●							●
0821 05 FWT 4208* Forest Biodiversity and Protected Area Management Sessional/ Fieldwork	●	●							●
0821 05 FWT 4209* Urban Forestry and Arboriculture	●	●							
0821 05 FWT 4212 Forest Management Plan Sessional/Fieldwork	●	●	●			●	●	●	●
0821 05 FWT 4214* Forestry Internships	●	●	●	●	●	●	●	●	●

Note*: The Course code is designated by: (a) a four-digit International Standard Classification of Education (ISCED) code (0821 for Forestry), (b) a two-digit Discipline identity code (05 for Forestry and Wood Technology Discipline), (c) a two to four-letters-word identifying the Subject (FWT for Forestry and Wood Technology), and (d) a four-digit number referring to the academic year, term and nature of the course (odd number indicates a theoretical course and the even number a sessional, dissertation, and viva voce). For ninth and tenth digits, 01-50 will usually denote departmental courses, while 51-99 will usually denote non-departmental courses. The asterisk (*) indicates optional course. Thesis (0821 05 FWT 4114) is registered in First Term and evaluated in the Second Term as a culminating course.*

OUTCOME-BASED CURRICULUM

PART- B

17. Structure of the Curriculum

a) Duration of the Program	4 Years	08 Terms
b) Admission Requirements	The applicants having HSC or equivalent degree will be eligible for admission into this program. Other terms and conditions are set or revised periodically by the appropriate authority.	
c1) Graduating Credits / Total Minimum Credit Requirement to Complete the Program	160	
c2) Available Credits	196	
d) Total Class Weeks in a Term*	14	
e) Minimum CGPA Requirements for Graduation	2.50	
f) Maximum Academic Years of Completion	7 Years	

*Term Duration				
Teaching and Learning	Preparatory Leave	Term Final Examination	Term Break	Total
14 Weeks	2 Weeks	4 Weeks	2 Weeks	22 Weeks

g1) Area-wise Credit Distribution				
Area	Type	Number of Courses	Credits	Total Credit
General Education (GED) Courses**	Theory	13	38	**51**
	Sessional	10	13	
Core/Compulsory Courses	Theory	29	84	**109**
	Sessional	25	27	
Optional/Elective Courses	Theory	8	22	**29**
	Sessional	7	7	
Capstone Courses***	Sessional	2	7	**7**
Total		**94**	**196**	**196**

** 26% from GED courses; *** Thesis, project, internship etc. courses

g2) Category of Courses			
Area	Course Type	Course Title	Credits
General Education (GED) Courses	Theory	1. Chemistry 2. Physics 3. Functional and Communicative English 4. Zoology 5. Geology and Soil Science 6. Introduction to Environmental Science 7. Mathematics 8. Sociology 9. Aerial Photogrammetry and Remote Sensing 10. Statistics 11. Environmental Impact Assessment and Management 12. Research Methodology 13. Accounting	38
	Sessional	1. Chemistry Sessional 2. Physics Sessional 3. Computer Applications in Forestry Sessional-I 4. Geology and Soil Science Sessional/Fieldwork 5. Introduction to Environmental Science Sessional/Fieldwork 6. Computer Applications in Forestry Sessional -II 7. Aerial Photogrammetry and Remote Sensing Sessional/Fieldwork 8. Statistics Sessional 9. Research Methodology Sessional/Fieldwork 10. Geographic Information System Sessional	13
Core/ Compulsory Courses	Theory	1. Introduction to Forestry 2. Forest Botany and Dendrology 3. Wood Structure and Properties 4. Forest Tree Physiology 5. Wood Physics and Mechanics 6. Forest Ecology 7. Forest Genetics and Tree Improvement 8. Non-wood Forest Products and Utilization	82

		9. Mycology and Forest Pathology 10. Forest Surveying 11. Species Silviculture and Silvicultural Practices 12. Mangroves Ecology and Costal Afforestation 13. Wood Chemistry 14. Silvicultural Systems 15. Forestry Extension and Community Organization 16. Forest Mensuration and Inventory 17. Wood Seasoning and Preservation 18. Forest Economics and Forest Product Marketing 19. Biocomposites and Adhesion Technology 20. Forest Harvesting and Transportation Engineering 21. Social Forestry and Rural Development 22. Wildlife Management and Nature Based Tourism 23. Agroforestry and Farming System 24. Forest Management 25. Pulp and Paper Technology 26. Forest Policy and Governance 27. Forest Law and Administration 28. Mangrove Resources Management and Utilization	
	Sessional	1. Introduction to Forestry Sessional/Fieldwork 2. Forest Botany and Dendrology Sessional/Fieldwork 3. Wood Structure and Properties Sessional 4. Forest Tree Physiology Sessional/Fieldwork 5. Wood Physics and Mechanics Sessional 6. Forest Ecology Sessional/ Fieldwork 7. Forest Genetics and Tree Improvement Sessional/Fieldwork 8. Non-wood Forest Products and Utilization Sessional/Fieldwork 9. Mycology and Forest Pathology Sessional/Fieldwork 10. Forest Surveying Sessional 11. Species Silviculture and Silvicultural Practices Sessional/Fieldwork 12. Mangroves Ecology and Costal Afforestation Sessional/Fieldwork 13. Wood Chemistry Sessional 14. Silvicultural Systems Sessional/Fieldwork 15. Forestry Extension and Community Organization Sessional/Fieldwork 16. Forest Mensuration and Inventory Sessional/Fieldwork 17. Wood Seasoning and Preservation Sessional/Fieldwork 18. Biocomposites and Adhesion Technology Sessional/Fieldwork 19. Forest Harvesting and Transportation Engineering Sessional/Fieldwork. 20. Social Forestry and Rural Development Sessional/Fieldwork 21. Viva voce	27

		22. Wildlife Management and Nature Based Tourism Sessional/Fieldwork 23. Agroforestry and Farming System Sessional/Fieldwork 24. Pulp and Paper Technology Sessional/Fieldwork 25. Forest Policy and Governance Sessional/Fieldwork 26. Forest Management Plan Sessional/Fieldwork	
Optional/ Elective Courses	Theory	1. Sawmilling, Saw doctoring and Wood Working 2. Soil Conservation and Watershed Management 3. Forest Entomology and Pest Management 4. Rubber and Tea Science 5. Forest Development Planning and Project Designing 6. Wood Modification and Properties Improvement 7. Forest Biodiversity and Protected Area Management 8. Urban Forestry and Arboriculture	22
	Sessional	1. Sawmilling, Saw doctoring and Wood Working Sessional/Fieldwork 2. Soil Conservation and Watershed Management Sessional/Fieldwork 3. Forest Entomology and Pest Management Sessional/Fieldwork 4. Rubber and Tea Science Sessional/Fieldwork 5. Forest Development Planning and Project Designing Sessional 6. Wood Modification and Properties Improvement Sessional/Fieldwork 7. Forest Biodiversity and Protected Area Management Sessional/ Fieldwork	7
Capstone Courses	Sessional	1. Forestry Internships 2. Thesis	7
Total		**94 courses**	**196**

18. Year/Term-wise Distribution of Courses

First Year First Term						
Course Code	**Course Title**	**Course Status**	**Contact Hours/Week**		**Credits**	**Prerequisites**
			Theory	**Sessional**		
0821 05 FWT 1101	Introduction to Forestry	Core	3		3	None
0821 05 FWT 1102	Introduction to Forestry Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 1103	Forest Botany and Dendrology	Core	3		3	None
0821 05 FWT 1104	Forest Botany and Dendrology Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 1105	Wood Structure and Properties	Core	3		3	None
0821 05 FWT 1106	Wood Structure and Properties Sessional	Core		1.5	1	None
0531 05 Chem 1151	Chemistry	Optional	3		3	None
0531 05 Chem 1152	Chemistry Sessional	Optional		1.5	1	None
0533 05 Phy 1153	Physics	Optional	3		3	None
0533 05 Phy 1154	Physics Sessional	Optional		1.5	1	None
0231 05 Eng 1155	Functional and Communicative English	Core	2		2	None
0613 05 CSE 1156	Computer Applications in Forestry Sessional-I	Core		3	2	None
Total	Core Courses:08, Optional Courses: 04, Theory Courses: 06, Sessional Courses: 06		17.0	10.5	24	-
			27.5			

First Year Second Term						
Course Code	**Course Title**	**Course Status**	**Contact Hours/Week**		**Credits**	**Prerequisites**
			Theory	**Sessional**		
0821 05 FWT 1201	Forest Tree Physiology	Core	3		3	None
0821 05 FWT 1202	Forest Tree Physiology Sessional/Fieldwork	Core		1.5	1	None
0511 05 FWT 1203	Zoology	Optional	3		3	None
0821 05 FWT 1205	Wood Physics and Mechanics	Core	2		2	None
0821 05 FWT 1206	Wood Physics and Mechanics Sessional	Core		1.5	1	None
0532 05 FWT 1207	Geology and Soil Science	Core	3		3	None
0532 05 FWT 1208	Geology and Soil Science Sessional/Fieldwork	Core		1.5	1	None
0521 05 FWT 1209	Introduction to Environmental Science	Optional	3		3	None
0521 05 FWT 1210	Introduction to Environmental Science Sessional/Fieldwork	Optional		1.5	1	None
0541 05 Math 1251	Mathematics	Core	3		3	None
0314 05 Soc 1253	Sociology	Core	3		3	None
Total	Core Courses: 08, Optional Courses: 03, Theory Courses: 07, Sessional Courses: 04		20.0	6.0	24	…
			26			

Second Year First Term						
Course Code	**Course Title**	**Course Status**	**Contact Hours/Week**		**Credits**	**Prerequisites**
			Theory	**Sessional**		
0821 05 FWT 2101	Forest Ecology	Core	3		3	None
0821 05 FWT 2102	Forest Ecology Sessional/ Fieldwork	Core		1.5	1	None
0821 05 FWT 2103	Forest Genetics and Tree Improvement	Core	3		3	None
0821 05 FWT 2104	Forest Genetics and Tree Improvement Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 2105	Sawmilling, Saw doctoring and Wood Working	Optional	3		3	None
0821 05 FWT 2106	Sawmilling, Saw doctoring and Wood Working Sessional/Fieldwork	Optional		1.5	1	None
0821 05 FWT 2107	Non-wood Forest Products and Utilization	Core	2		2	None
0821 05 FWT 2108	Non-wood Forest Products and Utilization Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 2109	Mycology and Forest Pathology	Core	3		3	None
0821 05 FWT 2110	Mycology and Forest Pathology Sessional/Fieldwork	Core		1.5	1	None
0732 05 CE 2151	Forest Surveying	Core	3		3	None
0732 05 CE 2152	Forest Surveying Sessional	Core		1.5	1	None
0613 05 CSE 2154	Computer Applications in Forestry Sessional -II	Optional		3	2	None
Total	Core Courses: 10, Optional Courses: 03, Theory Courses: 06, Sessional Courses: 07		17	12	25	…
			29			

Second Year Second Term						
Course Code	**Course Title**	**Course Status**	**Contact Hours/Week**		**Credits**	**Prerequisites**
			Theory	**Sessional**		
0821 05 FWT 2201	Species Silviculture and Silvicultural Practices	Core	3		3	None
0821 05 FWT 2202	Species Silviculture and Silvicultural Practices Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 2203	Mangroves Ecology and Costal Afforestation	Core	3		3	None
0821 05 FWT 2204	Mangroves Ecology and Costal Afforestation Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 2205	Wood Chemistry	Core	3		3	None
0821 05 FWT 2206	Wood Chemistry Sessional	Core		1.5	1	None
0716 05 FWT 2207	Aerial Photogrammetry and Remote Sensing	Core	3		3	None
0716 05 FWT 2208	Aerial Photogrammetry and Remote Sensing Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 2209	Soil Conservation and Watershed Management	Optional	3		3	None
0821 05 FWT 2210	Soil Conservation and Watershed Management Sessional/Fieldwork	Optional		1.5	1	None
0542 05 Stat 2251	Statistics	Core	3		3	None
0542 05 Stat 2252	Statistics Sessional	Core		1.5	1	None
Total	Core Courses: 10, Optional Courses: 02, Theory Courses: 06, Sessional Courses: 06		18	9	24	…
			27			

Third Year First Term						
Course Code	Course Title	Course Status	Contact Hours/Week		Credits	Prerequisites
			Theory	Sessional		
0821 05 FWT 3101	Silvicultural Systems	Core	3		3	None
0821 05 FWT 3102	Silvicultural Systems Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 3103	Forestry Extension and Community Organization	Core	3		3	None
0821 05 FWT 3104	Forestry Extension and Community Organization Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 3105	Forest Entomology and Pest Management	Optional	2		2	None
0821 05 FWT 3106	Forest Entomology and Pest Management Sessional/Fieldwork	Optional		1.5	1	None
0821 05 FWT 3107	Forest Mensuration and Inventory	Core	3		3	None
0821 05 FWT 3108	Forest Mensuration and Inventory Sessional/Fieldwork	Core		1.5	1	None
0521 05 FWT 3109	Environmental Impact Assessment	Optional	3		3	None
0821 05 FWT 3111	Wood Seasoning and Preservation	Core	3		3	None
0821 05 FWT 3112	Wood Seasoning and Preservation Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 3113	Forest Economics and Forest Product Marketing	Core	3		3	None
Total	Core Courses: 09, Optional Courses: 03, Theory Courses: 07, Sessional Courses: 05		20	7.5	25	…
			27.5			

Third Year Second Term						
Course Code	**Course Title**	**Course Status**	**Contact Hours/Week**		**Credits**	**Prerequisites**
			Theory	**Sessional**		
0821 05 FWT 3201	Biocomposites and Adhesion Technology	Core	3		3	None
0821 05 FWT 3202	Biocomposites and Adhesion Technology Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 3203	Forest Harvesting and Transportation Engineering	Core	2		2	None
0821 05 FWT 3204	Forest Harvesting and Transportation Engineering Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 3205	Social Forestry and Rural Development	Core	3		3	None
0821 05 FWT 3206	Social Forestry and Rural Development Sessional/Fieldwork	Core		1.5	1	None
0111 05 FWT 3207	Research Methodology	Core	3		3	None
0111 05 FWT 3208	Research Methodology Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 3209	Wildlife Management and Nature Based Tourism	Core	3		3	None
0821 05 FWT 3210	Wildlife Management and Nature Based Tourism Sessional/Fieldwork	Core		1.5	1	None
0720 05 FWT 3211	Rubber and Tea Science	Optional	2		2	None
0720 05 FWT 3212	Rubber and Tea Science Sessional/Fieldwork	Optional		1.5	1	None
0731 05 URP 3252	Geographic Information System Sessional	Optional		3	2	None
Total	Core Courses: 10, Optional Courses: 03, Theory Courses: 06, Sessional Courses: 07		16	12	24	…
			28			

Fourth Year First Term						
Course Code	**Course Title**	**Course Status**	**Contact Hours/Week**		**Credits**	**Prerequisites**
			Theory	**Sessional**		
0821 05 FWT 4101	Agroforestry and Farming System	Core	3		3	None
0821 05 FWT 4102	Agroforestry and Farming System Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 4103	Forest Management	Core	3		3	None
0821 05 FWT 4105	Forest Development Planning and Project Designing	Optional	3		3	None
0821 05 FWT 4106	Forest Development Planning and Project Designing Sessional	Optional		1.5	1	None
0821 05 FWT 4107	Pulp and Paper Technology	Core	3		3	None
0821 05 FWT 4108	Pulp and Paper Technology Sessional/Fieldwork	Core		1.5	1	None
0821 05 FWT 4109	Wood Modification and Properties Improvement	Optional	3		3	None
0821 05 FWT 4110	Wood Modification and Properties Improvement Sessional/ Fieldwork	Optional		1.5	1	None
0821 05 FWT 4112	Viva voce	Core			1	None
0821 05 FWT 4114	Thesis	Core		5	5	None
0411 05 BA 4151	Accounting	Optional	3		3	None
Total	Core Courses: 07, Optional Courses: 05, Theory Courses: 06, Sessional Courses: 06		18	11	28	…
			29			

<table>
<tr><th colspan="7">Fourth Year Second Term</th></tr>
<tr><th rowspan="2">Course Code</th><th rowspan="2">Course Title</th><th rowspan="2">Course Status</th><th colspan="2">Contact Hours/Week</th><th rowspan="2">Credits</th><th rowspan="2">Prerequisites</th></tr>
<tr><th>Theory</th><th>Sessional</th></tr>
<tr><td>0821 05 FWT 4201</td><td>Forest Policy and Governance</td><td>Core</td><td>3</td><td></td><td>3</td><td>None</td></tr>
<tr><td>0821 05 FWT 4202</td><td>Forest Policy and Governance Sessional/Fieldwork</td><td>Core</td><td></td><td>1.5</td><td>1</td><td>None</td></tr>
<tr><td>0821 05 FWT 4203</td><td>Forest Law and Administration</td><td>Core</td><td>3</td><td></td><td>3</td><td>None</td></tr>
<tr><td>0821 05 FWT 4205</td><td>Mangrove Resources Management and Utilization</td><td>Core</td><td>3</td><td></td><td>3</td><td>None</td></tr>
<tr><td>0821 05 FWT 4207</td><td>Forest Biodiversity and Protected Area Management</td><td>Optional</td><td>3</td><td></td><td>3</td><td>None</td></tr>
<tr><td>0821 05 FWT 4208</td><td>Forest Biodiversity and Protected Area Management Sessional/Fieldwork</td><td>Optional</td><td></td><td>1.5</td><td>1</td><td>None</td></tr>
<tr><td>0821 05 FWT 4209</td><td>Urban Forestry and Arboriculture</td><td>Optional</td><td>3</td><td></td><td>3</td><td>None</td></tr>
<tr><td>0821 05 FWT 4212</td><td>Forest Management Plan Sessional/Fieldwork</td><td>Core</td><td></td><td>3</td><td>3</td><td>None</td></tr>
<tr><td>0821 05 FWT 4214</td><td>Forestry Internships</td><td>Optional</td><td></td><td>3</td><td>2</td><td>None</td></tr>
<tr><td rowspan="2">Total</td><td colspan="2" rowspan="2">Core Courses: 05, Optional Courses: 04,
Theory Courses: 05, Sessional Courses: 04</td><td>15</td><td>9</td><td rowspan="2">22</td><td rowspan="2">…</td></tr>
<tr><td colspan="2">24</td></tr>
</table>

Summary of credit in all Years and Terms						
Year	**Term**	**Theory**		**Sessional/Fieldwork**		**Total**
		Core	**Optional**	**Core**	**Optional**	
First	First	11	6	5	2	**24**
	Second	14	6	3	1	**24**
Second	First	14	3	5	3	**25**
	Second	15	3	5	1	**24**
Third	First	15	5	4	1	**25**
	Second	14	2	5	3	**24**
Fourth	First	10	9	7	2	**28**
	Second	9	6	4	3	**22**
Total		**102**	**40**	**38**	**16**	**196**

***Note**: The Course code is designated by: (a) a four-digit International Standard Classification of Education (ISCED) code (0821 for Forestry), (b) a two-digit Discipline identity code (05 for Forestry and Wood Technology Discipline), (c) a two to four-letters-word identifying the Subject (FWT for Forestry and Wood Technology), and (d) a four-digit number referring to the academic year, term and nature of the course (odd number indicates a theoretical course and the even number a sessional, dissertation, and viva voce). For ninth and tenth digits, 01-50 will usually denote departmental courses, while 51-99 will usually denote non-departmental courses.*

19. Course Description

First Year First Term

Course Code: 0821 05 FWT 1101	**Year:** First	**Term:** First
Course Title: Introduction to Forestry		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Gathering knowledge on the extent and distribution, types, composition, condition, and contribution of national and global forests are foremost important aspect to have a good start of forestry education which has been considered towards reversing the overall trend of forest loss and degradation.	

Course Contents		**CLOs**
Section A		
1	**Introduction:** Definition and concept of forest, forestry and forester; classification of forest and forestry; scope of studying forestry; objectives and importance of forestry.	1, 2
2	**World Forests:** Extent of forest resources; global forest characteristics; climatic and vegetation zones and forest formation; biological diversity or biodiversity; forest health and vitality; productive, protective, and socioeconomic functions of forest resources; issues in forest sector.	1, 2, 3
3	**Introduction to Major Forestry Areas:** Silviculture; ecology; forest mensuration and inventory; forest protection; tree improvement; wood seasoning and preservation; social forestry; agroforestry.	1, 2
4	**Tangible and Intangible Benefits of Forest:** Concepts; functions of forests in the tangible and intangible benefits. Tangible and intangible benefits of various ecological and legal forests of Bangladesh.	3, 4
Section B		**CLOs**
5	**Bangladesh Forests:** Country profile; Weather and climate; land use; forests extent	1, 2, 3
6	**Forest types of Bangladesh:** Ecological forest types: extent, distribution, status, site conditions, major species composition; legal classification of forests; Protected forest areas	1, 3
7	**Forest degradation and deforestation:** Causes of forest degradation and deforestation: land tenure problem, encroachment, shifting cultivation, illicit felling; impacts and solution of the problems; Sustainable Development Goals (SDGs) in particular goal 15: Life on land, to stop degradation and preserve forest ecosystems.	1, 2

8	**Functions and Administration of Forest Related Organizations in Bangladesh:** Forest Department (FD); Bangladesh Forest Research Institute (BFRI); Bangladesh Forest Industries Development Corporation (BFIDC); Bangladesh Chemical Industries Corporation (BCIC)	2, 3, 4
9	**The Forest Sector and National Economy of Bangladesh:** Forest resources situation; uses of forest resources; contribution of forestry sector to the national economy.	2, 3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify the key terminologies used in forestry in order to pursue upcoming courses	1, 2
	CLO2	Interpret the status, distribution, composition of global and Bangladesh forests	1, 2, 9
	CLO3	Explain the structures and function of the institution/organization related to Bangladesh forest management, education and research.	1, 2, 9
	CLO4	Evaluate the contribution of forest resources to national economy	1, 2 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Group Discussion	Viva voce and Final Exam.

Learning Materials

Recommended Readings

1. Haque, S.M.S. (2013) Introduction to Forestry in Bangladesh, Institute of Forestry and Environmental Science, University of Chittagong, 331 pp
2. Grebner, D.L., Bettinger, P., Siry, J.P. (2013) Introduction to Forestry and Natural Resources, Academic Press, Waltham, USA
3. Shrivastava, M.B. 1997. Introduction to Forestry. Vikas Publishing House Pvt. Ltd, New Delhi.
4. Wenger, K.E. 1984. Forestry Handbook, 2nd Ed. John Wiley and sons, New York.
5. Pant, M.M. 1990. Marketing of forest products in Bangladesh. UNDP/FAO/BGD/85/011. Field Document No. 16. Development of Professional education in forestry sector, IFCU, Chittagong and FAO, Rome.

Supplementary Readings

6. Sharpe, G.W., Hended, C.W. and Allen, W.F. 1986. Introduction to forestry. 4th ed. McGraw Hill Book Co. New York.
7. Young, R.A. 1982. Introduction to forest science. John Wiley and sons, New York.
8. State of the World's Forest 2020 – FAO (www.fao.org)
9. Global Forest Resources Assessment 2020 – FAO (www.fao.org)
10. Bangladesh Forest Department (http://www.bforest.gov.bd/)

Course Code: 0821 05 FWT 1102	**Year:** First	**Term:** First
Course Title: Introduction to Forestry Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		

Rationale	Students of this course are expected to have practical knowledge on the actual situation of Bangladesh forest and forestry sector to give a good start of forestry education.
Course Objectives	Students of this course will be taken to the various ecological and legal forest areas of Bangladesh to practically learn the condition, composition, contribution, and issues related to the forest.

Course Contents		**CLOs**
Tasks		
1	The course includes orientation tours to different ecological and legal forest areas such as the Sundarbans; the hill forests of Chittagong, Chittagong Hill Tracts; Cox's Bazar; Sylhet; the plain land Sal forest of Dhaka, Gazipur, Mymensingh, Tangail.	1, 2, 3
2	The course includes orientation tours to different plantation areas especially the social forests areas such as road side plantations, agroforestry and block plantations of Jessore, Khulna, Satkhira and adjoining areas.	1, 2
3	Student will visit to various forest related institutions and industries to acquaint with different forestry activities	1, 2
4	Students will prepare reports at the end of field visits.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify forest types and its extent and distribution in Bangladesh.	1, 2
	CLO2	Explain the condition, composition, contribution of forest and issues related to forest in Bangladesh.	1, 2, 9
	CLO3	Demonstrate the management procedure of Bangladesh forests in line with the strength and weakness.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 1103	**Year:** First	**Term:** First
Course Title: Forest Botany and Dendrology		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course is important for identification of woody plants and their taxonomic interrelationships; for preservation and conservation of forest tree species.	

Course Contents		**CLOs**
Section A		
1	**Introduction to Forest Botany:** Importance and scopes of forest botany in forestry; branches of botany: definition, objectives, and importance.	1, 2
2	**Taxonomy**: Definition, objectives and scope; nomenclature, identification and units of classifications	1, 2
3	**Cell Biology:** Definition, Prokaryotic and eukaryotic cells -structural and ultra-structural details. Structure and function of extracellular matrix (cell wall) and membranes-cell adhesion, membrane transport and vesicular transport. Structure and function of cell organelles. Definition, importance and types of cell division; Mitosis and meiosis; molecular basis of cell cycle. Numerical and structural variations in chromosomes and their significance	3, 4
4	**Reproductive Biology in Higher Plants**: Pollination-Definition, types and agents with special reference to important mangrove and plain land forest species of Bangladesh. Process and development of embryos and endosperms, dispersal of fruits and seeds with special emphasis on important forest species.	3, 4
5	**Anatomy**: Tissue and tissue system, secondary growth in dicots and growth in monocots.	3, 4
Section B		**CLOs**
6	**Introduction to dendrology:** definition, scope and importance.	5, 6
7	**Phytogeography**: Salient features of hydrophytes, xerophytes, halophytes and mesophytes and their adaptations.	5, 6
8	**Phenology and distribution**: Phenology, geographical distribution, habitat requirements, silvicultural characteristics, regeneration and economic importance of important forest species.	5, 6

9	**Description of families:** Describe the identifying characters, economic importance of forest species of the following families (with examples) (i) Dicots: Vervenaceae, Dipterocarpaceae, Legunimosae, Meliaceae, Sterculiaceae, Mythraceae, Anacardiaceae, Rhizophoraceae, Moraceae, Rubiaceae, Loranthaceae. ii) Moncots: Graminae and Palmae iii) Gymnosperm: Pinaceae.	5, 6
10	**Herbarium, Botanical Garden and Arboretum**: Their objectives and functions with particular reference to forestry.	5, 6

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Define and use the technical terms applicable to forest botany in conversation with peers and technical reports	1, 2
	CLO2	Identify a variety of common native plants/ exotic trees, shrubs, herbs species with particular reference to different forest types in Bangladesh	1, 2, 9
	CLO3	Understand the reproduction biology of higher plants and to describe the basic structure and function of cell organelles and cell division	1, 2, 9
	CLO3	Understand primary and secondary growth, with an emphasis on how forest managers can apply this knowledge to influence wood properties and yield	1, 2, 9
	CLO4	Understand phenology, taxonomy, habitat, climatic requirements, silvicultural characteristics, economic importance of some forest tree fuel wood, and fodder species.	1, 2.,9
	CLO5	Understand the concepts, functions, establishment procedure of herbarium, botanical garden and arboretum.	1, 2, 9
	CLO6	Define and use the technical terms applicable to forest botany in conversation with peers and technical reports	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO6	Lecture and Group Discussion	Viva voce and Final Exam.

Learning Materials

Recommended Readings

1. Cobley, L.S. & Steele, W.M. 1976. An Introduction to the Botany of Tropical Crops. The English Language Book Society and Longman, London, U.K.
2. Butta, A.C. 1972. A Class Book of Botany. Oxford University Press, Fanadany House, Calcutta 13, India.
3. Fattah & Islam. 1979. College Biology. Jahangir & Sons, 42 Bangla Bazar, Dhaka.
4. Hill, A.F. 1979. Economic Botany. Tata McGraw Hill Book Publishing Co.Ltd, New Delhi, India.
5. Huq, A.M. 1986. Plant Names of Bangladesh. Bangladesh National Herberium, 229 Green Road, Dhanmondi, Dhaka.

Supplementary Readings

6. Mukherjee, H. 1974. Plant Groups. Books to Allied (p) Ltd., 8/1, Chintrnidas Calcutta-9, India.
7. Sharma, O.P. 1980. A Manual of Practical Botany. Vol. 1. Pragati Prakashani, Begum Bridge, Meerut- 25001, India. Benson, L. 1957. Plant Classification. Oxford & IBH Publishing Co. New Delhi, India.
8. Brandis, D. 1987. Indian Trees. Archibald Constable and Co. Ltd., 16 James Street Haymarket, S.W.
9. Drury, C.H. 1985. The Useful plants of India. International Book Distributors, 9/3, Rajpur road, Dehra Dun, India.
10. Harlow, W.M., Harrar, E.S. and while, F.M. 1952. Text Book of Dendrology. 6th Ed. McGraw Hill Book Co. Ltd. New York.

Course Code: 0821 05 FWT 1104	**Year:** First	**Term:** First
Course Title: Forest Botany and Dendrology Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course is designed for first year students of Forestry and Wood technology discipline tends to make attention on practical knowledge on identification of economically useful woody plants and their taxonomic interrelationships	

Course Contents		**CLOs**
Tasks		
1	Study of the internal structures of stem, root and leaf of dicot and monocot plants / trees.	1, 2
2	Field trip for collection and identification of fruits and seeds of important forest tree species study of natural diversity and submission of reports.	1, 2

3	Identification of woody plants on the basis of morphological and vegetative characteristics and study of families.	1, 2
4	Collection, preparation and preservation of herbarium specimens.	1, 2, 3
5	Field visits to important Botanical Gardens and forest areas of Bangladesh for field identification of different tree species and submission of reports.	1, 2, 3
6	Preparation of oral, poster, power point presentation and group discussion	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify a variety of common native plants / exotic trees, shrubs, herbs species with particular reference to different forest types in Bangladesh	1, 2
	CLO2	Identify internal structure of stems, root, leaf of dicot and monocot plants	1, 2, 9
	CLO3	Understand the functions, and establishment procedure of herbarium, botanical garden and arboretum	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Field visit to different herbarium, botanical garden and arboretum	Report Assessment and viva voce

Course Code: 0821 05 FWT 1105	**Year:** First	**Term:** First
Course Title: Wood Structure and Properties		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Wood structure and properties is an important part of wood science where fundamental structure and identification of wood will be emphasized	

Course Contents		**CLOs**
Section A		
1	**The plant:** Types of plant producing wood; characteristics of woody plants and non-woody plant	1, 2
2	**The tree:** Parts of the tree and seedling; Extent of secondary thickening in the tree stem during the first year. Development of the tree trunk from the young tree stem. The mature tree trunk.	1, 2

3	**The gross features of wood in identification:** The nature of gross feature, gross structural features. Annual rings, sapwood and heartwood, wood rays, wood parenchyma, resin canals, texture and grain softwoods and hardwoods.	1, 2
4	**Physical properties of wood in identification:** color, luster, odor and taste, weight and hardness.	1, 2
5	**The plant cell:** Characteristics of the plant cell, origin, enlargement, cell-wall thickening, spiral thickening, pits, pit pairs, phase of lignification, mature xylary cell.	1, 2
6	**The cambia of trees:** Cambial zone and cambium; kinds and arrangement of cambial initials; shape and size of cambial initials. Enlargement of xylary cells-longitudinal xylary cells, transverse xylary cells. Increase in girth of the cambium.	1, 2
Section B		
7	**The minute structure of porous woods:** Development of the elements of porous wood from cambial initials. Detailed description of elements of the porous wood-longitudinal parenchyma, longitudinal parenchyma, wood rays, normal and traumatic gum canals.	1, 2
8	**Variable quality of wood within a tree species:** quality of wood in relation to position in the tree, variation in structure, specific gravity and strength. Quality of wood in relation to growth increments. Quality of wood as affected by cell-wall composition. Quality of wood from old and from second-growth trees.	1, 2
9	**Figure in wood:** Cause of such figure, types of figure produced on the faces, boards and on the veneers. Figure attributable to the type of grain. Figure caused by interlocked grain, wavy and curly figure, blister figure, quilted figure, bird’s eye figure, figures resulting from twisted grain and uneven infiltration of colouring materials.	1, 2
10	**Defects in wood:** Natural defects, defects due to seasoning and machining, defects due to micro-organisms.	1, 2
11	**Natural durability of wood:** Durability of sapwood and heartwood; effect of density and rate of growth on durability; effect of climate, season of cutting and relative durability of wood.	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Describe the wood anatomical structure of the main species.	1, 2
	CLO2	Interpret the wood properties as a function of its structure.	1, 2, 9
	CLO3	Characterize the relationship between species, structures, properties and uses.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Butterfield, B. G. and Meylan, B. A. (1997). *Three-dimensional structure of wood*. Springer Nature.
2. Albersheim, P., Darvill, A., Roberts, K., Sederoff, R. and Staehelin, A. (2010). Plant cell walls: from chemistry to biology. Taylor and Francis Group.
3. Desch, H. E. and Dinwoodie, J. M. (1996). *Timber: structure, properties, conversion and uses* (7th edition). MacMillan Press Ltd., London.
4. Evert, R. F. (2006). *Esau's plant anatomy: meristems, cells, and tissues of the plant body: their structure, function and development*, 3rd edition. John Wiley & Sons, Inc.
5. Hoadly, R. B. (1995). *Identifying Wood: Accurate results with simple tools*. The Taunton Press, USA.

Supplementary Readings

6. Kolamann, F. F. P. and Cote, W. A. Jr. (1968). *Principle of Wood Science and Technology: Solid Wood*, Vol. 1. Springer-Verlag, Berlin.
7. Panshin, A. L. and de Zeeuw, C. (1982). *Textbook of wood technology*, Vol -1. McGraw Hill Book Company.
8. Tsoumis, G. (1991). *Science and technology of wood: structure, properties and utilization*, Verlag Kessel.

Course Code: 0821 05 FWT 1106	**Year:** First	**Term:** First
Course Title: Wood Structure and Properties Sessional		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	The course is designed to learn practical knowledge about the structural properties of wood.	

Course Contents		**CLOs**
Tasks		
1	Wood structure and properties of commercial timbers of Bangladesh with hand lens.	1, 2
2	The Techniques of preparing, sectioning, staining and mounting of woody tissues and fibres for microscopic study.	1, 2
3	Wood structure and properties by microscopic study.	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Describe the different gross features and minute features of wood structures.	1, 2, 9
	CLO2	Identify the wood species by observing the anatomical structures of wood.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Laboratory works and Presentation	Report Assessment and viva voce
CLO2	Laboratory works and Presentation	Report Assessment and viva voce

Course Code: 0531 05 Chem 1151*	**Year:** First	**Term:** First
Course Title: Chemistry		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course aims to learn and understand the basic of chemistry, different chemical reactions and kinetics, volumetric analysis of solution in reaction and organic functional groups that may help the students to understand the different physiological and physicochemical properties of forest ecosystem.	

Course Contents		**CLOs**
Section A		
1	**Volumetric analysis:** Requirement of volumetric analysis; Acidemetry and alkalimetry; Standard solution; Classification of the methods of volumetric analysis; Types of titration; Theory of neutralization reaction; Heat of reaction, formation, combustion and neutralization. Ionization of acids, bases and salts; Ionization of strong and weak electrolytes; Theory of buffer solution, concept of pH.	1, 2, 3
2	**Solution:** Different units of concentration; Factors influencing the solubility of a substance; Mechanism of dissolution; Liquefaction of gases; Properties of dilute solution; lowering of vapour pressure; Depression of freezing point; Elevation of boiling point and osmotic pressure.	1, 2
3	**Colloids**: Colloids and crystalloid; Classification of colloids; General methods of preparation of colloidal solution; properties of colloids; coagulation, peptization and electrophoresis.	1, 2
Section B		
4	**Atomic structure:** Modern concept of the structure of atom; Rutherford's atom model; Bohr's atomic model; Quantum number; Pauli exclusion principle; Isotopes, Isobars and Isotopes; Electronic configuration of elements.	1, 2

5	**Oxidation Reduction:** Definition; modern concept, writing of equations involving oxidation reduction reactions; Oxidation-reduction potentials; Concept of redox indicators.	1, 2
6	**Chemical Kinetics:** First and second order reactions and their simple treatment; Determination of the order of reactions; Outline of Arrhenius and Collision theory.	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand the fundamentals of physical chemistry	1, 2
	CLO2	Comprehend the organic chemistry	1, 2, 3
	CLO3	Understand chemical reactions	1, 2, 3

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Recommended references

1. Bhyan, A.L. Physical Chemistry
2. Hoque and Nawab- Physical Chemistry
3. Haque, S. and S. Islam- Analytical Chemistry
4. Vogel Longmans, A.J. - Quantitative organic and inorganic analysis
5. Haideh- Modern Inorganic Chemistry
6. Bahl & Tuli - Physical Chemistry

Course Code: 0531 05 Chem 1152*		**Year:** First	**Term:** First
Course Title: Chemistry Sessional			
Course Status: Optional			
Credit: 1.0			
Prerequisite(s): None			
Rationale	This course provides understanding of different chemical solution preparation and their volumetric analysis that may help to increase their chemical analytical ability needed for soil, water and wood analysis in forestry.		

Course Contents		**CLOs**
Tasks		
1	Preparation of solutions and volumetric analysis. Determination of ferrous iron with standard $KMnO_4$ solution.	1, 2, 3

2	Oxidation, reduction and titrations involving: Preparation and standardization of N/10 $KMnO_4$ solution with sodium oxalate solution	1, 2, 3
3	Preparation of Standard N/10 $K_2Cr_2O_7$ solution and standardization to $Na_2S_2O_3$.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Prepare different chemical solution	1, 2
	CLO2	Carry out volumetric analysis of oxidation and reduction reaction using titration	1, 2, 3
	CLO3	Describe the method of preparation of standard solution.	1, 2, 3

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Laboratory works and Presentation	Report Assessment and viva voce
CLO2	Laboratory works and Presentation	Report Assessment and viva voce
CLO3	Laboratory works and Presentation	Report Assessment and viva voce

Course Code: 0533 05 Phy 1153*	**Year:** First	**Term:** First
Course Title: Physics		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course aims to make the student understand the basic of physics that may help them to understand properties of wood as a physical product.	

Course Contents		**CLOs**
Section A		
1	**Physical quantities:** Scalars, vectors; scalar products, vector product, gradient, divergence & curl.	1, 2, 3
2	**Motion in one and two-dimensions:** Frames of reference; particle kinetics, displacement, velocity, acceleration; projectile motion; uniform motion.	1, 2
3	**Work and Energy:** Work done by a constant force; power; kinetic and potential energies; conservation of momentum and energy.	1, 2

4	**Oscillations:** The simple harmonic oscillator; its amplitude, frequency, time period and energy.	1, 2, 3
5	**Gravitation:** Newton's law of universal gravitation; universal gravitational constant; acceleration due to gravity 'g'; gravitational effect of spherical distribution of matter; motion of planets and satellites; energy in a gravitational field.	1, 2
6	**Properties of matter:** Elasticity; stress and strain; Hook's law; longitudinal, shear and bulk moduli; elastic and plastic substances. Surface Tension: Rise of liquid in a capillary tube; angle of contact; temperature and surface tension. Fluids: Fluid pressure; hydrostatic equation; viscous fluid; Poiseulle's equation.	1, 2, 3
Section B		
7	**Heat and thermodynamics:** Specific heat: Newton's law of cooling, conduction, convection, and radiation of heat; mechanical equivalent of heat; first law of thermodynamics; thermodynamic processes	1, 2,3
8	**Light**: Reflection, refraction, transmission and absorption; electromagnetic radiation; Interference & diffraction.	1, 2,3
9	**Electricity:** Coulomb's law; Ohm's law; capacitance and resistance and their laws; Kirchoff's law. D.C. and A.C. power and their applications.	1, 2
10	**Modern physics**: Radioactivity and its application, Nuclear Fission & Fusion reaction.	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Demonstrate the fundamentals of physical and mechanical properties.	1, 2
	CLO2	Explain motion, work, energy, oscillation, gravitation of physical matter.	1, 2, 3
	CLO3	Describe properties of matter.	1, 2, 3

Mapping CLOs with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Recommended references

1. Haliday & Resnick. Physics for students of Science and Engineering, Part I and II. Wiley, N.Y.
2. Hossain, T. 1975. A Text Book of Heat. 2nd Ed. Barnamala Press and Publications Limited; 31/32, P.K. Roy Road, Bangla Bazar, Dhaka.
3. Kalimuddin, M. 1974. A Text Book of Magentism, Electricity and Modern Physics. 2nd Ed. Mollick.

4. Beisen Arthur: Concept of Modern Physics, Fourth Edition, McGraw Hill Book Company.
5. Theraja, B.L. Modern Physics. S. Chand and Company Ltd.
6. Mazumdar, K.G.A Text Book of Optics. Ideal Publishers, 14, Ramanath Mazumdar Street, Calcutta.
7. Mathur, D.S. 1983. Elements of Properties of Matter. S. Chand & Company Ltd, New Delhi.

Course Code: 0533 05 Phy 1154*	**Year:** First	**Term:** First
Course Title: Physics Sessional		
Course Status: Optional		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course aims to deliver the basic experiments of physics that may help students understand and measure different properties of wood	

Course Contents		**CLOs**
Tasks		
1	Use compound pendulum to calculate “g”	1, 2, 3
2	Calculate Young’s modules & rigidity modulus of wood	1, 2
3	Calculate surface tension of water	1, 2
4	Measure specific heat conductance of wood	1, 2, 3
5	Measure the electric resistance of wood	1, 2, 3
6	Learn Melde’s and Newton's rings experiment.	1, 2, 3
7	Use compound pendulum to calculate “g”	1, 2, 3
8	alculate Young’s modules & rigidity modulus of wood	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Use compound pendulum to calculate “g”	1, 2
	CLO2	Calculate Young’s modules & rigidity modulus of wood	1, 2
	CLO3	Calculate surface tension of water	1, 2
	CLO4	Measure specific heat conductance of wood	1, 2, 3
	CLO5	Measure the electric resistance of wood	1, 2, 3
	CLO6	Perform the Melde’s and Newton's rings experiment.	1, 2, 3

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Laboratory works and Presentation	Report Assessment and viva voce
CLO2	Laboratory works and Presentation	Report Assessment and viva voce
CLO3	Laboratory works and Presentation	Report Assessment and viva voce

Course Code: 0231 05 Eng 1155	**Year:** First	**Term:** First
Course Title: Functional and Communicative English		
Course Status: Core		
Credit: 2.0		
Prerequisite(s): None		
Rationale	The course aims to develop communicative competence in English for the students of the discipline. The medium of instruction in the university is English and it is expected that students would understand what is taught in English in a particular course.	

Course Contents		**CLOs**
Section A		
1	Processes of Word Formation and Transformation, Proper use of parts of speech	1, 2
2	Basic Sentence Structures	1, 2
3	Clauses and Phrases	3, 4
4	Joining sentences, Transformation of Sentences, Framing W/H Questions	3, 4
5	Perspectives on reading: Elements of reading: vocabulary, syntax and meaning; scanning and skimming's expectation and interpretation; contextual understanding and understanding the whole text; effective note-taking	3, 4
Section B		**CLOs**
6	Art of good speaking, Notions and Functions, Speaker-listener Rapport, Intonation and Stress	5, 6
7	Process of writing, understanding Academic writing: features and elements	5, 6
8	Mechanics in writing:	5, 6
9	Capitalization and Punctuation;	5, 6
10	Generating ideas for a writing task; Drafting and Supporting ideas with evidence; Integrating data and graphics into texts;	5, 6
11	Modes of writing; writing tasks; paragraph, Essay, Summary, Precise, Report, Abstract, Letter of application, Assignment, Examination Paper	5, 6
12	Guidelines for developing Listening skills, Role of a Good Listener, Listening Comprehension.	5, 6

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify and apply the structures of basic sentences.	4, 5
	CLO2	Identify clauses and phrases	4, 5

	CLO3	Learn different approaches to reading	4, 5
	CLO4	Learn the art of speaking and how to communicate in different situation	8, 9
	CLO5	Learn about different modes of writing and be able to write various academic writing	8, 9
	CLO6	Learn the techniques of listening	8, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO6	Lecture and Group Discussion	Viva voce and Final Exam.

Learning Materials

Recommended Readings

1. Pyle, Michael A. & others. 1986. Test of English as a Foreign Language. Cliffs Notes, Inc. U.S.A.
2. Taylor, Clive, 1978. Advancing Language skills. The University Press Ltd., Bangladesh.

Course Code: 0613 05 CSE 1156	**Year:** First	**Term:** First
Course Title: Computer Applications in Forestry Sessional - I		
Course Status: Core		
Credit: 2.0		
Prerequisite(s): None		
Rationale	Students are expected to learn the basics of computer applications in forestry, so that they are capable of applying the knowledge in advanced courses such as forest mensuration and inventory, GIS, research methodology, forest management, thesis etc.	

Course Contents		**CLOs**
Tasks		
1	Overview of computer and available software for word processing and spreadsheet analysis.	1, 2, 3
2	Create, open, edit and save word files and database files.	1, 2
3	Application of different data file formats, such as XLSX, DOCX, PPTX, DBF, TXT, CSV, SHP etc.	1, 2

4	Perform basic mathematical expressions such as sum, average, min, max, slope, intercept, correlation, linear equation, standard deviation, variance, co-efficient of variation (CV), count, histogram etc. using spreadsheet software.	1, 2, 3
5	Create graphs and tables with example data sets using spreadsheet software.	2, 3, 4
6	Summarize large data sets using Pivot-Table of spreadsheet software.	2, 3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Create, edit and save database files for analysis	3, 9
	CLO2	Demonstrate basic mathematical expressions for statistical analysis of data	3, 9
	CLO3	Create graphs and tables from data	3, 9
	CLO4	Write reports using word processors	3, 5, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Laboratory works and Presentation	Report Assessment and viva voce
CLO2	Laboratory works and Presentation	Report Assessment and viva voce
CLO3	Laboratory works and Presentation	Report Assessment and viva voce
CLO4	Laboratory works and Presentation	Report Assessment and viva voce

First Year Second Term

Course Code: 0821 05 FWT 1201	**Year:** First	**Term:** Second
Course Title: Forest Tree Physiology		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	This course intends to provide student a general knowledge on tree physiology, its role in forest ecology, management and productivity.

Course Contents		**CLOs**
Section A		
1	**General introduction**: Definition, scope, physiological processes and conditions, Kleb's concept.	1, 2
2	**Nutrition**: Mineral nutrition, their sources, function and deficiency symptoms; cultural techniques (sand and water cultures).	1, 2
3	**Water relation**: Importance of water to plants, soil water forms, absorption of water, path of movement of water through root, ascent of sap, factors affecting the rate of water absorption.	3, 4
4	**Transpiration**: Kinds of transpiration & their mechanism, factors affecting the rate of transpiration, significance of transpiration, factors affecting transpiration.	3, 4
5	**Transport of materials**: The transporting system, mechanisms of translocation, factors affecting translocation.	3, 4
Section B		**CLOs**
6	**Mineral salt absorption in plants**: Steps of salt absorption in root cells, radial movement of ions from surface cells to xylem & translocation from root to shoot.	4, 5
7	**Photosynthesis**: Introduction, the chloroplast pigments, factors affecting chlorophyll formation, mechanism of photosynthesis, factors affecting photosynthesis; photoinhibition; chlorophyll fluorescence;	1, 4, 5
8	**Respiration**: Definition, importance, kinds of respiration, mechanism of respiration (Glycolysis and Kreb's cycle), factors affecting respiration.	1, 4, 5
9	**Growth and development:** Concept of growth and development, parameters of growth, growth regions, phases of growth-cell formation, cell elongation and cell differentiation; growth of root, shoot and leaf; factors affecting growth; phenotypic plasticity,	4, 5
10	**Reproduction**: Floral parts, pollination and fertilization, growth and development of fruits of angiosperm; asexual reproduction - sprouting, stem, leaf and root cuttings; layering, grafting.	4, 5
11	**Plant growth regulators**: Growth and senescence, phytohormone, characteristics of phytohormone, classification of phytohormone, effect of phytohormone on plant growth and development.	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Explain the physiological processes like photosynthesis and respirations in forest trees and apply in practical field	1, 2
	CLO2	Conceptualize and understand the general physiological processes like transpirations and translocations in forest trees	1, 2
	CLO3	Describe the factors affecting the physiological processes and conditions of forest trees	1, 2
	CLO4	Demonstrate how a single cell (zygote) develops into mature trees	1, 2
	CLO5	Demonstrate phytohormone influencing tree growth and development	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Stephen, G. and Pallardy. 2008. Physiology of Woody Plants (Third Edition). Academic Press, UK.
2. Taiz,. L. and Zeiger, E. 2003. Plant Physiology (Third Edition). Sinauer Associates, Annals of Botany Company.
3. Hopkins, W. G. 2006. Photosynthesis and Respiration. Chelsea House, New York.
4. Brukhin, V. and Morozova, N. 2011. Plant Growth and Development: Basic Knowledge and Current Views.
5. Srivastava, L. M. 2002. Plant Growth and Development. Elsevier, Canada.

Course Code: 0821 05 FWT 1202	**Year:** First	**Term:** Second
Course Title: Forest Tree Physiology Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Gain practical knowledge on plant physiological processes.	

Course Contents Tasks		CLOs
1	Demonstration of the equipment used in tree physiological studies	1, 2, 3
2	Measurement of photosynthesis and respiration in field condition	1, 2
3	Measurement chlorophyll content in green leaves	1, 2
4	Writing and submission of report	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Explain the physiological processes through which heredity and environment interact	1, 2
	CLO2	Demonstrate the major physiological processes like photosynthesis, respiration, transpiration, and translocation.	1, 2
	CLO3	Measure the chlorophyll content in green leaves	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Laboratory works and presentation	Report Assessment and viva voce

Course Code: 0511 05 FWT 1203*	**Year:** First	**Term:** Second
Course Title: Zoology		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Wildlife is one of the key components of forest ecosystem. Forests provide habitats for wildlife. A fundamental knowledge of forest zoology is important for forestry education. This course will help the students to acquire the fundamental knowledge on wildlife.	

Course Contents Section A		CLOs
1	**General Study:** Classification and morphology of Annelids, Arthropoda, Mollusca, Echinodermatia, Pisces, Amphibia, Reptilia, Aves and Mammalia.	1, 2
2	**Taxonomy**: Definition, hierarchy of classification and taxonomic categories, procedure of taxonomic works, taxonomic keys.	1, 2

3	**Wildlife Physiology:** respiration, circulation, digestion, excretion and reproduction; origin, function and deficiency symptoms of different kinds of vitamins and hormones	1,2,3
Section B		**CLOs**
4	**Evolution and coevolution:** Definition, theories of evolution, coevolution, Larmackism, Darwinism, speciation, evolution of elephant, tiger, monkey and deer.	1,2,3
5	**Wildlife Behaviour:** Definition, types, learning, taxes, instinct and reproductive behaviour; Food and feeding habits of tiger, deer, elephant, crocodile, snake and birds.	1,2,3
6	**Wildlife Ecology:** Types and principles of ecology; hierarchy of ecology, environment and niche, population and population growth models, survivors curve, age structure, community ecology, energy flow in ecosystem, freshwater, marine and terrestrial ecology.	1,2,3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Explain about physiology, ecology and behavior of wild animals	1, 2
	CLO2	Demonstrate about classification of animal kingdom	1, 2
	CLO3	Describe about the major wildlife species of Bangladesh.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Mayr, E. and Ashlock, P. D. (1991). Principles of Systematic Zoology. Hill College. -McGraw .India
2. Reddy, P.B. (ed.) (2015). Text Book of Animal Physiology. Ratna Prasad Multidisciplinary Research & Educational Society. DOI: 10.13140/RG.2.1.4807.9441.
3. Alcock, J. (2022). Animal Behaviour: An Evolutionary Approach (10th Edition). Link (free access: 7th edition): https://media.oiipdf.com/pdf/78b7ae60-01db-4372-ae12-c801a466bd0e.pdf

4. Fryxell, J. M., Sinclair, A. R. E. and Caughley, G. (2014). Wildlife Ecology, Conservation, and Management (3rd Edition). Wiley Blackwell. (2nd edition has free access to download).
5. Miller, G. T. Jr. and Spoolman, S. E. (2009). Essentials of Ecology (7th edition). Brooks/Cole, Cengage Learning. Link (free access: 5th edition): https://silo.pub/essentials-of-ecology-fifth-edition.html

Course Code: 0821 05 FWT 1205	**Year:** First	**Term:** Second
Course Title: Wood Physics and Mechanics		
Course Status: Core		
Credit: 2.0		
Prerequisite(s): None		

Rationale	Physical and mechanical properties of wood determines the usability of wood. This fundamental properties of wood will help to understand wood science and technology.

Course Contents		**CLOs**
Section A		
1	**Hygroscopicity of wood:** Definition of moisture content; How moisture is held in wood, Maximum moisture content, free water, bound water, equilibrium moisture content, fiber saturation point; Process of determining moisture content; sorption of water by wood and other cellulosic materials.	1, 2
2	**Shrinkage and swelling of wood:** Anisotropic nature of wood, mechanism of shrinkage and swelling of wood, factors affecting shrinkage and swelling, Determination of shrinkage and swelling, Importance of shrinkage and swelling, Dimensional changes, water repellence and dimensional stabilization of wood.	1, 2
3	**Density and specific gravity of wood:** Definition, factors affecting density and specific gravity, Determination of density, cell wall density and porosity; calculation of weight and buoyancy, Impacts of extractives and inorganic materials on density, fluid flow in wood, Fick's law no steady and steady state; permeability and diffusion.	2, 3
Section B		**CLOs**
4	**Thermal properties of wood:** Expansion and contraction, thermal conductivity, specific heat, thermal diffusivity, combustion of wood, heating value, Thermal expansion co-efficient, calorific value of wood	3, 4
5	**Electrical properties of wood:** Electrical Resistance, Dielectric properties, electrical conductivity, coefficient of friction	3, 4
6	**Mechanical deformation of wood**: Stress, Strain, Hooks law, Compressive deformation of wood, factors affecting deformation of wood, viscoelastic behavior, mechanism of creep and relaxation.	3, 4

7	**Strength properties of wood:** Basic concepts, properties (tension, compression, shear, impact bending, hardness, cleavage and nail holding), bending strength, calculation of MOR and MOE factors influencing strength properties, basic working stresses and their application in the design of timber structures.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Describe the wood-water relationship and its effect on the performance of the final products.	1, 2, 9
	CLO2	Explain the elementary statics and strength of materials of wood and wood-based materials.	1, 2, 9
	CLO3	Measure the elastic and strength properties of solid wood in the three orthotropic directions in response to axial, shear and bending actions.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Bowyer J. L., Shmulsky, R. and Haygreen, J. G. (2007). *Forest products and wood science: an introduction* (5th ed). Blackwell Publishing, USA.
2. Desch, H. E. and Dinwoodie, J. M. (1996). *Timber: structure, properties, conversion and uses* (7th edition). MacMillan Press Ltd., London.
3. Farmer, R. H. (1967). *Chemistry in the utilization of wood*. Pergamon Press, Oxford, UK.
4. Fengel, D. and Wegener, G. (1984). *Wood: chemistry, ultrastructure and reactions*. Walter de Gruyter, Berlin.
5. Forest Product Laboratory (2010). *Wood handbook: wood as an engineering material* (Centennial Edition). USDA Forest Service, Madison.

Supplementary Readings

6. Kolamann, F. F. P. and Cote, W. A. Jr. (1968). *Principle of Wood Science and Technology: Solid Wood*, Vol. 1. Springer-Verlag, Berlin.
7. Panshin, A. L. and de Zeeuw, C. (1982). *Textbook of wood technology*, Vol. 1. McGraw Hill Book Company, London.
8. Troup, R. S. (1970). *Indian Forest Utilization*, Vol-1. Forest Research Institute, India.
9. Tsoumis, G. (1991). *Science and technology of wood: structure, properties and utilization*, Verlag Kessel.

Course Code: 0821 05 FWT 1206	**Year:** First	**Term:** Second
Course Title: Wood Physics and Mechanics Sessional		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Practical knowledge of physical and mechanical properties of wood is essential to know the performance.	

Course Contents		**CLOs**
Tasks		
1	Determination of moisture content of wood.	1, 2, 3
2	Determination of shrinkage and swelling of various wood species.	1, 2
3	Determination of green, dry density, basic density, cell wall density and specific gravity.	1, 2
4	Carry out Static bending test; tension, compression, shear and hardness of wood,	1, 2, 3
5	Calculation of MOE and MOR, Impact bending test.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Evaluate the method of moisture content, shrinkage, swelling, density and specific gravity.	1, 2
	CLO2	Test wood using standard testing procedures and equipment to assess their mechanical properties and interpret the results.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Laboratory works and presentation	Report Assessment and viva voce
CLO2	Laboratory works and presentation	Report Assessment and viva voce

Course Code: 0532 05 FWT 1207	**Year:** First	**Term:** Second
Course Title: Geology and Soil Science		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Geology and soil science is the founding course of Forest science. Understanding of geology and soil science enables students to understand spatial distribution of species and growth of forest crops. The course also highlights interaction between forestry operations and soil site productivity.	

Course Contents		CLOs
Section A		
1	**Introduction**: Scope and importance of Geology and Soil Science in forestry; branches of geology and their importance; origin, general information, compositions and interior of the Earth; causes of earthquakes and volcanoes; natural processes of earth interiors modification; mankind impacts on the earth and the environment.	1, 2
2	**Mineralogy**: Definition, importance, and objectives of mineralogy; definition, characteristics, and different physical properties, classification of minerals; minerals identification; study of essential and accessory minerals; soil forming minerals.	1, 2
3	**Petrology**: Definition, importance, and objectives of petrology; classification and characteristics of rocks and their formation; igneous, metamorphic and sedimentary rock structures and textures; description of common rocks and soils of Bangladesh; Bowen reaction series; rock cycle; rock identification.	1, 2
4	**Paleontology**: Definition, importance, and objectives of paleontology; forms and uses of fossils; fossils and fossilization; fossils and geological time scale; indexed fossils; trace fossils: importance and usefulness; fossil fuels and fossil fuels formation.	1, 2
5	**Regional geology**: Geology and geomorphology of Bangladesh.	1, 2
Section B		**CLOs**
6	**Introduction:** Definition and scope of Soil science, Importance of soil.	3, 4
7	**Soil formation:** Factors of soil formation, Weathering of rocks and minerals; physical, chemical and biological agents and their role in weathering of rocks and mineral. Soil forming processes; soil profiles and their sub-divisions.	3, 4
8	**Properties of soil**: Physical properties: Particles, texture, structure, density, porosity, compaction, air, temperature, water, color. Chemical Properties: Soil solution, reaction, liming, buffering capacity, ion exchange, base saturation capacity, salinity, sodicity, base carbonate, redox potential. Biological properties: soil flora and fauna, plant roots, Mycorrhizae.	3, 4
9	**Organic Matter:** Sources of Organic Matter in Forest Soil, Categories of SOM, Functions of Organic Matter in Forest Soil, Forest Floor, Chemical Composition of SOM, Dissolved Organic Matter in Forest Soil, Types of Humus in Forest Soils, Organic Matter Content in Forest Soils, SOM turnover.	3, 4
10	**Forest Soil:** History of forest soil science and its management, Soils of Tropical Rainforests, Evergreen Forests, and Deciduous Forests, Soils of Tropical Freshwater Swamp Forests, Soils of Tropical Mangrove Forests	3, 4
11	**The soils of Bangladesh**: Soil classification in Bangladesh, Major soil types of Bangladesh, problem soils of Bangladesh.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Explain the basic concepts of soil and its relation with forestry.	1, 2
	CLO2	Describe the basic properties of soil to ensure sustainable use of soil.	1, 2
	CLO3	Identify rocks, and minerals which are essential for plant growth and to identify common fossils and their ages as well as the conditions under which they lived.	1, 2
	CLO4	Evaluate soil forming factors and processes and soil environments for plant growth and development.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Plaster, E. (2014). *Soil science and management* (6^{th} edition). Cengage learning
2. Jhonson, C. (2009). *Biology of soil science*. Oxford Book Company.
3. *Weil R.R & Brady, N.C. (2017). The Nature and Properties of Soils, 15th edition. Pearson Education ISBN 978-0-13-325448-8*
4. Binkley, D. & Fisher, R. F. (2019). *Ecology and management of forest soils* (5^{th} edition). John Wiley & Sons.
5. Curl, E. A. & Truelove, B. (2012). *The rhizosphere* (Vol. 15). Springer Science & Business Media.

Supplementary Readings

6. Osman, K.T. (2013). Forest soils: properties and Management. Springer.
7. Huq, S. I. & Shoaib, J. M. (2013). *The soils of Bangladesh*. Dordrecht: Springer.
8. Kirkham, M. B. (2014). *Principles of soil and plant water relations*. Academic Press.
9. Bardgett, R. D., Usher, M. B., & Hopkins, D. W. (2005). *Biological diversity and function in soils*. Cambridge University Press.
10. Pankhurst, C. E. & Doube, B. M. (1997). *Biological indicators of soil health: synthesis*. Cab International.
11. Barker, A. V., & Pilbeam, D. J. (Eds.). (2015). *Handbook of plant nutrition*. CRC press.

Course Code: 0532 05 FWT 1208	Year: First	Term: Second
Course Title: Geology and Soil Science Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	The practical; and filed level experience in different forest and non-forest soil is crucial for proper enumeration of soil properties and relevant qualities of soil for predicting suitability of forestry activities.	

Course Contents		CLOs
Tasks		
1	Identification of rocks	1, 2, 3
2	Method of soil sampling	1, 2
3	Study of soil profile in the field	1, 2
4	Determination of soil moisture	1, 2, 3
5	Mechanical analysis of soil by Hydrometer Method	1, 2, 3
6	Determination of soil organic matter by wet Oxidation Method.	1, 2, 3
7	Estimation of available N, P & K in soil.	1, 2, 3
8	Determination of pH and EC of soil.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Describe the soil forming parent materials and types of soil produced	1, 2
	CLO2	Perform chemical and physical analysis of soil	1, 2
	CLO3	Identify soil profile and different horizons	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0521 05 FWT 1209*	Year: First	Term: Second
Course Title: Introduction to Environmental Science		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Students are expected to learn the fundamentals of environmental science, environmental pollution and interactions of forest ecosystems environment.	

Course Contents Section A		CLOs
1	**Introduction to Environmental Science:** Definition, scope, objectives and importance of Environmental Science, global environmental challenges.	1, 2
2	**Man and the environment:** An introduction to atmosphere, lithosphere, hydrosphere and biosphere.	1, 2
3	**Global Change:** Climate and weather, climate change, depletion of ozone layer, global warming, greenhouse effect, rise in sea level & ways to avert these.	1, 2
4	**Major environmental problems in Bangladesh:** Pollution, arsenic contamination, river bank erosion, loss of wet land, forest degradation.	1, 2
5	**Human health and the environment:** major categories of human health risk, historical and emerging infectious diseases, chemical toxins, Factors Influencing Toxicity, dose-response studies, prospective studies and retrospective studies, risk analysis	1, 2
Section B		**CLOs**
6	**Environmental pollution:** A brief introduction to environmental pollution. Types and sources of air, water, soil and noise pollution and their effects on man, animals and plant health, recent development of pollution control mechanisms, Plant Species in controlling the environmental pollution.	2, 3
7	**Solid and hazardous waste:** sources of waste, waste disposal methods, waste recycling, hazardous and toxic waste.	2, 3
8	**Recent development in control strategies of environmental issues:** Recent development in control strategies of air, water and soil pollutions; global strategies and treaties to combat pollution and climate change, and to maintain sustainable development.	2, 3

	Upon completion of this course the students will be able to:		**Mapping with PLOs**
Course Learning Outcomes (CLOs)	CLO1	Describe characteristics of environmental problems and their relationships to the sustainability of life;	1, 2
	CLO2	Explain basic principles of science, bio-geochemical systems, and their role in ecosystems;	1, 2
	CLO3	Demonstrate sufficient background and experience to successfully continue in more advanced science courses if desired.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Kellomaki, S., Kilpelainen, A. and Alam. A. 2013. Forest Bioenergy Production: Management, Carbon Sequestration and Adaptation. Springer. New York.
2. Richardson, J., Bjorheden, R. Hakkila, P., Lowe, A.T, Smith, C.T. 2006. Bioenergy from Sustainable Forestry Guiding Principles and Practice. Kluwer Academic Publisher. New York.

Course Code: 0521 05 FWT 1210*	**Year:** First	**Term:** Second
Course Title: Introduction to Environmental Science Sessional/Fieldwork		
Course Status: Optional		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Students are expected to learn the fundamentals of environmental science, environmental pollution and interactions of forest ecosystems environment from field visit to different environmentally important areas including forest areas and plantations.	

Course Contents		**CLOs**
Tasks		
1	Visit to different environmentally important areas including forest areas and plantations, to acquaint students with different environmental and forestry activities, and preparation of reports.	1, 2, 3
2	Field visit to observe soil, water and air pollution in an area experiencing environmental pollution and their impact on nearby forest ecosystems.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Explain basic components of environment	1, 2
	CLO2	Describe interactions of forest with environment.	1, 2
	CLO3	Contribute to formulate pollution control strategy	1, 2
	CLO4	Contribute to formulate climate change mitigation	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0541 05 Math 1251	Year: First	Term: Second
Course Title: Mathematics		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course is designed to ensure all students who will achieve a basic level of mathematics that will serve them well in the completion of the degree in B. Sc. (Hons) in forest as well as further application in the field of forestry.	

Course Contents		CLOs
Section A		
1	**Differential Calculus:** Differentiation of function	1, 2
2	**Integral Calculus:** Methods of integration by parts	1, 2
3	**Higher Trigonometry:** De Moivere's theorem and its applications	1, 2
Section B		**CLOs**
4	**Equations and matrices:** Inequalities, relation between roots and coefficients of algebric equations; summation series; coefficients of algebric equations; convergency and divergency; matrices (definition, elementary properties, addition, multiplication of matrices), inverse matrix, solution of equations with the help of matrices.	3, 4
5	**Analytical Geometry:** General equation of second degree; straight lines, pairs of straight lines, circles and parabola.	3, 4

	Upon completion of this course the students will be able to:		Mapping with PLOs
Course Learning Outcomes (CLOs)	CLO1	Apply mathematical knowledge and understanding to solve problems.	1, 2, 3
	CLO2	Develop an ability to work independently and co-operatively when doing Mathematics.	1, 2, 3
	CLO3	Acquire a secure foundation for the further study of Mathematics in the field of forestry.	1, 2, 3

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Hall, H.S. and Knight S.R. 1961. Higher Algebra. MacMillan and Co. Ltd., New York.

2. Peterson, G.L. 1989. Algebra and Trigonometry. Words Worth Publicating Company, Belmont, California.
3. Shahidullah, A.M.M. and Bhattacharjee, P.V. 1988. A text Book on Higher Algebra and Trigonometry. H.L. Bhattacharjee, 124 Chandarpura, Chittagong.
4. Abdur Rahman, A. F.M. and Bhattacharjee P. K. 1989. A Text Book on Co-ordinate Geometry with Vector Analysis. Student Ways, Bangla Bazar, Dhaka-1.
5. Mohammad, K. and Bahttacharijee, P.K. 1988. A Text Book on Differential Calculus. S. Tripaty, 124 Chandanpura, Chittagong.
6. Mohammad, K. and Bhattacharijee, P.K. 1987. A Text Book on Integral Calculus. H. Bhattacharjee, 124 Chandanpura, Chittagong.

Course Code: 0314 05 Soc 1253	**Year:** First	**Term:** Second
Course Title: Sociology		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	This course is designed to introduce students to the basic concepts, theories, scholars and methods of Sociology. This course will pay attention to the meaning of 'think sociologically' and how this differs from other ways of observing the world around us. It will focus on the systematic understanding of social relations, social interaction, social structure, social organization, social institutions, culture and social change. This course will also introduce students to key issues addressed by contemporary sociologists; i.e. Social class, social stratification and inequality, deviance and crime, economy and work, politics and media, population and environment and so on.

Course Contents		**CLOs**
Section A		
1	**Understanding Sociology:** Definition, Nature and Scope of Sociology, Development of Sociology, Major Theoretical Perspectives of Sociology, Research in Sociology, and Necessity of Studying.	1, 2
2	**Basic Concepts of Sociology:** Society, Community, Association, Institution, Group, Norms, Values, Social Process.	1, 2
3	**Culture and Social Structure:** Meaning and Elements of Culture, Development of Culture around the World, Culture and Civilization; Theory of Cultural Lag, Definition and Elements of Social Structure, Social Structure in Global Perspective.	1, 2
4	**Socialization and Institutions:** Meaning, Theories and Agents of Socialization; Major Institutions-Family, Marriage, Kinship, Property, Division of Labor, Religion, Education, Government and State.	1, 2
5	**Social Stratification and Inequality:** Definition and Theories of Social Stratification, Determinants and Forms of Social Stratification; Meaning, Determinants and Dimensions of Social Inequality; Social Mobility.	1, 2

Section B		CLOs
6	**Changing World:** Types of Society; Social Change, Theories of Social Change, Resistance to Social Change, Technology and Social Change, Urbanization, Industrialization and Social Change.	2, 3
7	**Mass Media, Communication and Collective Behavior:** Meaning and Sociological Perspectives of Mass Media and Communication; Forms and Theories of Collective Behavior, New Communication Technology and Collective Behavior.	2, 3
8	**Deviance, Crime and Social Control:** Meaning and Theories of Deviance and Crime; Juvenile Delinquency; Definition and Agents of Social Control.	2, 3
9	**Population, Health and Environment:** Theories of Population, Basic Demographic Processes, Meaning of Health, Population and Environment.	2, 3
10	**Changing Society of Bangladesh:** Social Structure of Colonial Bangladesh, Neo-Colonialism and the Emergence of Bangladesh, Political Development and Social Problems of Bangladesh.	2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Explain basic sociological concepts, theories and methods logically and consistently	4, 5
	CLO2	Think deeply and apply sociological perspectives to various issues and problems in contemporary society	4, 5, 9
	CLO3	Apply the sociological perspectives in managing forest resources	6, 7, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Rice University (2013). Introduction to Sociology. OpenStax College: Houston, Texas. Link (open access): https://ufdcimages.uflib.ufl.edu/AA/00/01/41/68/00001/Sociology.pdf
2. The Sociology Book: Big Ideas Simply Explained. Link (open access): https://book.akij.net/eBooks/2018/January/5a659d3da0567/The_Sociology_Book_Big_Ideas_Simply_Explained.pdf
3. Giddens, A. (2006). Sociology (5th edition). Polity press: USA. Link (open access): https://www.shortcutstv.com/text/giddens5th.pdf

Second Year First Term

Course Code: 0821 05 FWT 2101	**Year:** Second	**Term:** First
Course Title: Forest Ecology		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	Students are expected to learn the fundamentals of ecology and forest ecology in particular to have a deeper understanding about the functioning of forest ecosystems, which has profound influence on forest management in practice.

Course Contents		**CLOs**
Section A		
1	**Introduction**: Basic concepts of forest ecology; forest ecology in relation to silviculture; forest and environmental management.	1, 2
2	**Ecosystem**: Concept and components of ecosystem; energy flow in the ecosystems, trophic level, food chain, food web; trophic structure, ecological pyramids, & ecological niche	5
3	**Site Factors**: Site factors (solar radiation, temperature, wind and water) and their effects on plant growth, regeneration and distribution; interrelations between site factors; effects of forest vegetation on site factors.	3, 4
4	**Forest Biogeochemistry**: Nutrient cycling, nutrient uptake, mycorrhizae and nutrient uptake; nutrient return, rainfall and nutrient input, litter-fall and nutrient return, soil organisms and their role in decomposition of organic matter, nutrient loss.	3, 4
Section B		**CLOs**
5	**Population Ecology:** Population growth and demographic characteristics, determinants of population size. Natural regulation of population size, perdition, plant population biology; importance of population ecology in forest management.	4, 5
6	**Community Ecology**: Structure and growth form of plant communities; distribution of species along the environmental gradients, ecotone, interaction between species in a community; the competitive exclusion principle and the ecological niche concept; community diversity, classification of communities; methods of studying plant community structure.	4, 5
7	**Succession and Retrogression**: Concept and stages of succession, concept of climax, causes of retrogression and its relation in forestry, gap phase dynamics.	4, 5

8	**Ecological modelling**: Concept of ecological modelling, applications and limitations	4, 5
9	**Tropical Forest**: Distribution, types, species composition, and forest types of Bangladesh.	4, 5
10	**Forest Fire:** Role of forest fire in ecosystem development, types of forest fire, forest fire prevention and control.	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand fundamentals of ecology	1, 2
	CLO2	Describe response of tree growth to environmental gradients	1, 2
	CLO3	Understand production process in forest ecosystems and plantations	1, 2
	CLO4	Describe interactions within and among tree species	1, 2
	CLO5	Understand ecosystem function and forest succession	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Kimmins, J. P. 1987. Forest Ecology. Macmillan Publishing Co.
2. Kamaluddin, M. 1984. Forest Ecology. Institute of Forestry, University of Chittagong, Chittagong, Bangladesh, 185 pp.
3. Spurr, S. H. and B. V. Barnes. 1980. Forest Ecology. 3rd ed. John Wiley & Sons, New York, 687 pp.
4. Whitmore, I. C. 1975. Tropical Rain Forest of the Far East. Clarnedon Press, Oxford, 283 pp.
5. Zabala, N. Q. 1990. Forest Ecology. UNDP/FAO/BGD/85/110. Field Document Number 6. Development of Professional Education in the Forestry Sector in Bangladesh. Institute of Forestry, Chittagong University, Chittagong & FAO Rome.

Course Code: 0821 05 FWT 2102	Year: Second	Term: First
Course Title: Forest Ecology Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		

Rationale	This course is designed to have a deeper understanding on various ecological aspects Students are expected to learn the fundamentals of ecology and forest ecology in particular to have a deeper understanding functioning of forest ecosystems, which has profound influence on forest management.

Course Contents		CLOs
Tasks		
1	Application of different methods of studying vegetation. Quantification of Importance Value (IV %) of tree species through relative abundance, relative dominance and relative frequency in sample plots in a natural forest.	1, 2, 3
2	Morphological and anatomical study of different ecological adaptations of selected forest species in natural forest.	1, 2, 3
3	Field trips to different natural forests in Bangladesh and report writing on observed ecological aspects.	1, 2, 3

	Upon completion of this course the students will be able to:		Mapping with PLOs
Course Learning Outcomes (CLOs)	CLO1	Describe response of tree growth in relation to site factors and environmental gradients	1, 2
	CLO2	Understand production process in forest ecosystems and plantations	1, 2
	CLO3	Describe interactions within and among trees species	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture, Presentation and Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 2103	**Year:** Second	**Term:** First
Course Title: Forest Genetics and Tree Improvement		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course is important for introductory knowledge in forest genetics, different breeding strategies and its application for conservation point of view.	

Course Contents		**CLOs**
Section A		
1	**Introduction to genetics:** basic concepts of gene, DNA, mRNA, tRNA, rRNA, Amino acid, Protein, genotype, genetics, Mendel's law, heredity, chromosomes: types, functions; alleles and locus, genotype and phenotype: definition, differences and relationship, traits: definition, types, heritability: definition, types and measurement; inbreeding and hybrid vigour.	1, 2
2	**Essentials of population genetics**: dynamics of self-pollinating and cross-pollinating plant populations; Hardy--Weinberg law, validity conditions; deviation of Hardy--Weinberg law: selection, mutation, migration and isolation.	1, 2
3	**Variability of forest tree species**: morphological variability, variability of physiological traits; Components of phenotype variability: Variation due to environment and genotype, measurement of variability within population and among population.	3, 4
4	**Breeding strategies**: selection, assessment of selection efficiency and genetic gain; species trial, provenance trials, progeny testing.	3, 4
Section B		**CLOs**
5	**Introduction to tree improvement**: definition, objectives, importance, basis, basic strategies	5, 6
6	**Propagation of improved material**: propagation by seed; vegetative propagation: grafting and budding, stem and branch cuttings, root cutting, leaf cutting, root sucker, apomixis, topophysis and tissue culture	5, 6
7	**Exotic Introduction**: definition, concepts, selection criteria, advantages and disadvantages	5, 6
8	**PPT Selection:** definition, importance, selection procedure, and applications	5, 6
9	**Testing of progenies:** verification of stands, seed orchards and individual trees, establishment and management of seed stand, seed orchard, seed production areas, gene conservation.	5, 6
10	**Clonal Forestry:** Definition; Cloning methods; establishment and management of stock plants; importance of clonal forestry in the tropics, potential application of clonal forestry in production forestry, agroforestry and multipurpose tree species.	5, 6

	Upon completion of this course the students will be able to:		Mapping with PLOs
Course Learning Outcomes (CLOs)	CLO1	Define and use the technical terms applicable to forest genetics and tree improvement in conversation with peers and technical reports	1, 2
	CLO2	Identify the determinant of environmental and genetic variation among population and within population	1, 2
	CLO3	Know about essentials of population genetics and to describe the conditions and factors influencing Hardy-Weinberg law	1, 2
	CLO3	Describe different propagation methods for genetic resources conservation	1, 2
	CLO4	Know different breeding strategies and to measure genetic gain	1, 2
	CLO5	Describe concepts, functions of clonal forestry with particular references to the tropics	1, 2
	CLO6	Define and use the technical terms applicable to forest genetics and tree improvement in conversation with peers and technical reports	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO6	Lecture and Group Discussion	Viva voce and Final Exam.

Learning Materials

Recommended Readings

1. Snustad, D.P and Simmons M. J. (2012). Principles of Genetics. John Wiley & Sons, Printed in the United States of America.
2. Brown, T. (2012). Introduction to Genetics, A molecular approach. Garland Science, Taylor and Francis Group. New York and London.
3. Zobel, B. and Talbert, J. 2003. Applied Forest Tree Improvement. Blackburn Press.
4. Finkeldey, R., & Hattemer, H. H. (2007). *Tropical forest genetics* (pp. 237-267). Berlin: Springer.
5. Wright, J. (2012). *Introduction to forest genetics*. Elsevier.

Supplementary Readings

6. Cortés, A. J., Restrepo-Montoya, M., & Bedoya-Canas, L. E. (2020). Modern strategies to assess and breed forest tree adaptation to changing climate. *Frontiers in Plant Science*, *11*.
7. Merkle, Scott A., and Jeffrey FD Dean. "Forest tree biotechnology." *Current opinion in biotechnology* 11.3 (2000): 298-302.
8. Williams, E. R., Matheson, A. C., & Harwood, C. E. (2002). *Experimental design and analysis for tree improvement*. CSIRO publishing.
9. Brown, T. (2012). Introduction to Genetics, A molecular approach. Garland Science, Taylor and Francis Group. New York and London.

Course Code: 0821 05 FWT 2104	**Year:** Second	**Term:** First
Course Title: Forest Genetics and Tree Improvement Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course is designed to provide practical knowledge on practical knowledge on forest genetics and its application on tree improvement.	

Course Contents		**CLOs**
Tasks		
1	Seed germination and seedling growths of several endangered forest tree species	1, 2, 3
2	Establishment of non-mist propagator for the development of rooting of cuttings	1, 2
3	Practice on vegetative propagation using different methods.	3, 4
4	Field practice on selection of individual plus trees and submission of report.	3, 4
5	Preparation of oral, poster, power point presentation and group discussion	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Apply seed germination techniques for enhancing germination percentages, rate and to describe different particulars of seedlings growth	1, 2
	CLO2	Establish low-cost propagator for the development of rooting of cuttings	1, 2
	CLO3	Carry out different techniques of macro-vegetative and micro-vegetative propagation	1, 2
	CLO4	Perform the selection procedure PPT in different private plantation areas/natural forest	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce

CLO3	Field visit to forest nurseries, Lecture and Presentation	Report Assessment and viva voce
CLO4	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 2105*	**Year:** Second	**Term:** First
Course Title: Saw Milling, Saw Doctoring and Wood Working		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course has endeavored to introduce basics in lumber conversion and its related equipment that are very much needed to any wood working projects. Students will learn woodworking skills through lecture, demonstration and practical application.	

Course Contents		**CLOs**
Section A		
1	**Introduction**: Objectives, importance, primary mechanical processing of logs, operations of basic conversion equipment.	1, 2
2	**Sawmilling:** Types of saws and sawmills, their functions, advantages and disadvantages of different types of saws and sawmills; blade dimension, cutting velocity and cutting resistance, influence of feed speed, pitch and kerf; methods of sawing; sawing wastes.	1, 2
3	**Saw doctoring and sharpening of blades:** Hazard identification, risk assessment, planning and prioritizing; saw sharpening, techniques for leveling, tensioning, welding.	1, 2
4	**Operation and Layout**: Saw milling operations; sawmill layout/ management, pollution control, safety practices in sawmill, log yards, log storage methods. Present status and future prospects of sawmilling in Bangladesh.	1, 2
Section B		**CLOs**
5	**Work Plan:** Working with wood, project design, parts of a plan, material selection (lumber defects, grading, hardware), measuring, stock layout	3, 4
6	**Wood Working Tools:** Hand tools and wood working machines, - sawing, planning and scarping, cutting, shaping and curving, drilling and boring, sanding, etc. Safety in wood working operations.,	3, 4
7	**Joining stock:** Wood joints, wood joints by hand, adhesives, clamping techniques, metal fasteners.	3, 4
8	**Preparing to Finish:** Coated abrasives, hand sanding, and removing defects from wood.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand the sawmill and its operational procedures	1, 2
	CLO2	Verify the ways of saw blade maintenance and installation	1, 2, 9
	CLO3	Identify the hand and power tools required for the woodworking projects with machines safety.	1, 2, 9
	CLO4	Be familiar with the timber grading rules and its application.	1, 2 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Hoadley, R. B. (2000). *Understanding wood: a craftsman's guide to wood technology*. The Taunton Press, USA.
2. English, J. (2015). Harvest your own lumber: how to fell, saw, dry and mill wood. Linden Publishing, USA.
3. Kolamann, F. F. P. and Cote, W. A. Jr. (1968). *Principle of Wood Science and Technology: Solid Wood*, Vol. 1. Springer-Verlog, Berlin.
4. Snyder, T. (2020). *The essential wood book: the woodworker's guide to choosing and using lumber*. Cedar Lane Press, Lancaster.
5. Troup, R. S. (1970). *Indian Forest Utilization*, Vol. 1. Forest Research Institute, India.
6. Walker, J. C. F. (2006). *Primary wood Processing: principles and practice*. Springer, Dordrecht.

Course Code: 0821 05 FWT 2106*	**Year:** Second	**Term:** First
Course Title: Saw Milling, Saw Doctoring and Wood Working Sessional/ Fieldwork		
Course Status: Optional		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This sessional course is designed to practice knowledge-based critical thinking and solution to wood working projects.	

Course Contents		CLOs
Tasks		
1	Tour to saw mills and observe the operations, stocking and saw doctoring procedures.	1, 2, 3
2	Industrial tour to different public and private wood working factories to observe conversion of logs, lumber and timber and preparation of reports.	1, 2
3	Visit to BFRI wood working and timber Engineering Division to closely observe various wood working processes & preparation of report.	1, 2
4	Practice the use of various wood working hand tools in the laboratory.	1, 2, 3
5	Selected woodworking in the workshop: cabinetmaking, carpentry, upholstering.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Describe the equipment used for woodworking projects and conversion processes for timber	1, 2
	CLO2	Identify the fundamental operations in sawmills with saw blade maintenance.	1, 2, 9
	CLO3	Perform quality control in conversion processes for timber	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 2107	**Year:** Second	**Term:** First
Course Title: Non-Wood Forest Products and Utilization		
Course Status: Core		
Credit: 2.0		
Prerequisite(s): None		
Rationale	Forests of Bangladesh harbor wood as well non-wood resources. Non-wood forest resources are currently receiving wide attention throughout the country. The course intends to provide student general knowledge about the multiple use, role, management, utilization and marketing of non-wood forest products and utilizations.	

Course Contents		CLOs
Section A		
1	**Non-Wood Forest Products**: concepts and definition; evolving perspectives; economic importance; present status of NWFPs in Bangladesh.	1, 2

2	**Bamboos, Canes, Murta**: Types, distribution and economic importance; collection, processing, manufacturing and marketing of bamboo, cane and murta-based products.	1, 2
3	**Fibers and flosses**: stem, leaves and fruits of various forest species producing Fibers and flosses	1, 2
4	**Essential oils**: Extraction of oils from wood, leaves, seeds and grasses of important forest species; Uses of Essential oils	1, 2
5	**Tans and dyes**: Extraction of Tannin and dyes from wood, bark, flowers and roots of important forest species; Uses of tans and dyes.	1, 2
6	**Gums, Resins and Oleoresins**: Extraction and uses of Gums, Resins and Oleoresins from important forest species.	1, 2
7	**Medicinal plants**: Extraction and uses of medicine from different parts of important medicinal plants.	1, 2
Section B		**CLOs**
8	**Non-wood-based industries:** Overview of non-wood-based rural industries/enterprises, definition of small-scale non-wood-based rural enterprises; basic characteristics of non-wood forest based-rural enterprise-technology, location, size, entrepreneurship, labour, role of non-wood forest based rural enterprises in community development.	3, 4
9	**Types of Non-Wood Forest Based Rural Industries**: Bamboo-based rural industries; rattan (cane) based rural industries; murta-based; agar-based; fruits and nuts based rural industries; medicinal plants; mushroom, tannins, gums, and essential oils; resin industry and sericulture.	3, 4
10	**Lac and manufacturing of shellac:** Nature, sources of lac, lac crops, collection and storage of shellac, properties and uses of lac.	3, 4
11	**Strategies to Promote Non-Wood Forest-based Rural Industries**: Markets and market development; financing; developing and promoting technology and technical skills; improving management and managerial skills; institutional support for small scale rural based processing enterprises; extension services for small scale industries; promoting communal small-scale forest-based processing enterprises	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Demonstrate the general concept and evolving perspective of Non-Wood Forest Products (NWFP) and Utilization.	1, 2
	CLO2	Explain the collection, processing, manufacturing and marketing of NWFP.	1, 2, 9
	CLO3	Evaluate the utilization of NWFP.	1, 2, 9
	CLO4	Develop ideas regarding entrepreneurship with NWFPs	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Murthy, T,K., 2010. Minor Forest Products of India: Non Timber Forest Products, 2nd edn, Bio-Green Books, India
2. Chowdhury, R. A. 2000. Minor Forest Products. September 2000. Dhaka, Bangladesh. Ministry of Environment & Forests (MoEF), Asian Development Bank (ADB), Global Environmental Facility (GEF), Government of the Netherlands.
3. Troup, R.S., 1907, Indian forest utilization, Calcutta : Office of the Superintendent of Government Printing, India
4. Forest Research Institute and Colleges, 1972, Indian Forest Utilization, Volume 2, Dehra Dun , India
5. Gupta, T and Guleria, A., 1992, Non Wood Forest products in India, Oxford and IBH Publishing Co. New delhi, India

Supplementary Readings

6. Arnold, J.E.M., et.al. 1987. The importance of small forest-based processing enterprises in developing countries. UNASYLVA, vol.39, No.3 & 4. Rome, Italy.
7. FAO. 1987. Small-scale forest based processing enterprises. FAO Forestry Paper No. 79, Rome, Italy.
8. FAO. 1987. Forest based Rural Enterprises: Pakistan. RAPA Publication 1987/3, Bangkok, Thailand.
9. FAO. 1986. Appropriate forest industries. FAO Forestry paper 68. Rome, Italy.

Course Code: 0821 05 FWT 2108	**Year:** Second	**Term:** First
Course Title: Non-Wood Forest Products and Utilization Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	The course intends to provide student about practical knowledge about the multiple use, role, management, utilization and marketing of non-wood forest products and utilizations.	

Course Contents		CLOs
Tasks		
1	Visit different forests areas like Sundarbans mangrove forest, Hill forests, Sal forest to observe various non wood forest products.	1, 2, 3

2	Visit various small scale non wood based forest industries like sericulture, lac culture, agar culture, hogla etc. in Bangladesh to observe processing, manufacturing and marketing of NWFP**.**	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Know about the general concept of non-wood forest resources in Bangladesh	1, 2
	CLO2	Learn about the collection, processing, manufacturing process of NWFP	1, 2, 9
	CLO3	Gain knowledge on various uses and marketing of NWFP	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 2109	**Year:** Second	**Term:** First
Course Title: Mycology and Forest Pathology		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course is designed to provide knowledge about the fundamentals of mycology, principles and practices of forest pathology.	

Course Contents		**CLOs**
Section A		
1	**Mycology**: Fungi: definition, characteristics, importance; Classification of fungi: nomenclature, general features; Structure of fungi: vegetative, reproductive; Mode of nutrition of fungi: saprophyte, parasite, symbiotic; enzymes produced by fungi; Mycorrhiza; Dispersal of fungi; Life cycle of selected fungi: *Ganoderma lucidum, Fusarium solani, Phytophthora spp.,* Pythium spp. Bacteria, viruses and mycoplasmae: characteristics, types, importance.	1, 2
2	**Forest Pathology**: Historical perspective of forest pathology; Definition of forest pathology, plant pathology and plant disease; Causes (factors) of plant diseases; How disease is caused in forest trees; Establishing the causes of disease in trees; Diagnosis of plant disease: Koch's postulates; Disease symptoms of forest trees: general and fungal disease.	1, 2
3	**Diseases in forest nurseries**: Symptomology, causes, prevention and/ or control.	1, 2

4	**Decay fungi of wood**: Decay processes, classification, spread and control; heart rots in living trees.	1, 2
Section B		**CLOs**
5	**Study of the important tree diseases**: Sundri, Keora, Teak, Mahogony, Gamar, Kanthal, Rubber, Sissoo, Pynkado and Bamboo.	2, 3
6	**Seed Pathology**: Introduction, seed disease problems and general importance.	2, 3
7	**Environmental factors that cause tree diseases**: Air pollution, water logging, drought etc.	2, 3
8	**Forest disease management:** Concepts of forest health, Self-defense mechanism of trees, principles of forest disease management and control, disease control triangle.	2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Describe the importance, classification, structures, characteristics, properties and life cycle of fungi.	1, 2
	CLO2	Explain the disease development, general disease symptoms, disease cycle, disease triangle, pathogenecity and diseases management.	1, 2
	CLO3	Describe the symptoms, causal pathogen and control of different forest tree diseases in nurseries and plantations.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Alexopoulos, C. S. and Mims, C. W. (1979). *Introductory mycology*. Wiley Eastern Limited New Delhi.
2. Bakshi, B. K. (1976). *Forest pathology: principles and practice in forestry*. Controller of Publications, India.
3. Blanchard, R.O. and Tattar, T. A. (1981). *Field and laboratory guide to tree pathology*. Academic Press.
4. Burns, R. (2009). *Plant pathology: techniques and protocols*. Human Press, USA.
5. Garbelotto, M. and Gonthier, P. (2018). *Forest Pathology and plant health.* MDPI, www.mdpi.com/journal/forest.

Supplementary Readings

6. Kirk, P. M., Cannon, P. F., David, J. C. and Stalpers, J. A. (2001). *Ainsworth and Bisby's dictionary of the fungi* (9th edition). CABI Publishing, UK.
7. Lundquist, J. E. and Hamelin, R. C. (2005). *Forest pathology: from genes to landscape*. American Phytopahthological Society, USA.
8. Parthasarathy, S. et al. (2021). *Diseases of forest trees and their management*. CRC Press.
9. Rahman, M. A., Baksha, M. W. and Ahmed, F. U. (1997). *Diseases and pests of tree species in forest nurseries and plantations in Bangladesh*. Bangladesh Agriculture Research Council, Dhaka.
10. Singh, R.S. (1984). *Introduction to principles of plant pathology*. Oxford & IBH Publishing Co. Calcutta.

Course Code: 0821 05 FWT 2110	**Year:** Second	**Term:** First
Course Title: Mycology and Forest Pathology Sessional / Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course is designed to provide practical knowledge regarding the laboratory procedures and Fieldwork of mycology and forest pathology.	

Course Contents		**CLOs**
Tasks		
1	Identification of major disease symptoms of trees and tree seedlings occurring in the forest nurseries, plantations and natural forests.	1, 2, 3
2	Identification of tree disease pathogens and wood rotting fungi.	1, 2
3	Techniques for isolation and culture of fungi.	1, 2
4	Field trips to different forest areas in Bangladesh for observation of tree disease and symptoms, collection of samples for isolation of causal pathogens.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify forest tree diseases by observing symptoms in the laboratory and field.	1, 2
	CLO2	Apply different laboratory procedures for isolation, identification, preservation and minimization of diseases causing pathogen.	1, 2
	CLO3	Identify different tree injuries caused by environmental factors.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0732 05 CE 2151	Year: Second	Term: First
Course Title: Forest Surveying		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course intends to give student a general introduction to land surveying, map preparation and map interpretation.	

Course Contents		**CLOs**
Section A		
1	**Introduction**: Scope objective and importance of surveying in forestry.	1, 2
2	**Scales**: Definitions; R.F., plain, diagonal and vernier scales.	1, 2
3	**Maps and map reading**: Classification of maps orientation.	1, 2
4	**Chain Survey**: Instruments; types bearings; field procedure; plotting, closing errors and corrections; recording and plotting.	1, 2
5	**Traverse Survey**: Angular instruments; types bearings; field procedure; plotting, closing errors and adjustments, theodolites- measurement of horizontal and vertical angles, measurement of bearings Azimuth.	1, 2
Section B		**CLOs**
6	**Plane Table survey**: General instrumentation and principle methods and procedure, setting up the table, radiation, intersection, traversing and resection.	2, 3
7	**Levels and Levelling**: Instrumentation; Principles of levelling; classification of levelling-direct and indirect levelling; profile levelling, common errors in levelling.	2, 3
8	**Topographical Survey**: Contouring; contour and contour lines; characteristics of contours, methods of contouring and contour drawing.	2, 3
9	**Area Computation**: Computation of area by planimeter and squares method.	2, 3
10	**Enlargement reduction and copying plans and maps**: Copying by tracing, graphical methods and mechanical methods, enlargement and reduction by proportional compass; by photographic and photo copying methods.	2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand forest land surveying, map preparation and map interpretation.	1, 2
	CLO2	Understand surveying terminology, distance and area measurement, surveying methods and equipment use, basic map drafting techniques, coordinate systems, and rectangular systems for land referencing	1, 2, 9
	CLO3	Understand techniques for distance and forest area measurement	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Aziz, M.A. and M. Shahjahan. 1974. Surveying. Zoberi and Pearl Publishers. Bangla Bazar, Dhaka-1
2. Bannister A. and S. Raymond. 1977. Surveying. Pitman Publishing Limited, London.
3. Brinker, R.C. and Wolf, P.R. 1984. Elementary Surveying (7th Ed.) Harper and Row Publishers, Inc. New York.
4. Shriver, C.L. 1966. Drawing and Blueprint Reading. 3rd Ed. McGraw Hill Book Company, New York.
5. Phylip, K. 1971. Surveying practice (2nd Ed.) McGraw Hill Book Co., New York.

Course Code: 0732 05 CE 2152	**Year:** Second	**Term:** First
Course Title: Forest Surveying Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Student will gain practical knowledge on how to measure forest land and prepare maps.	

Course Contents		**CLOs**
Tasks		
1	Demonstration on drawing equipment.	1, 2, 3
2	Lettering practices.	1, 2
3	Construction of different types of scales.	1, 2
4	Chain Surveying, transverse surveying.	2, 3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Learn chain surveying and transverse surveying	1, 2
	CLO2	Carry out contour mapping	1, 2, 9
	CLO3	Calculate area	1, 2, 9
	CLO4	Carry out copying, enlargement and reduction of maps	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce

CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Field visit to different forests and relevant organizations	Report Assessment and viva voce

Course Code: 0613 05 CSE 2154*	**Year:** Second	**Term:** First
Course Title: Computer Applications in Forestry Sessional -II		
Course Status: Optional		
Credit: 2.0		
Prerequisite(s): None		
Rationale	Students are expected to learn the advanced computer applications in forestry, so that they are capable of applying the gained knowledge in forestry applications.	

Course Contents		**CLOs**
Tasks		
1	Overview of computer programming.	1, 2, 3
2	Advanced statistical analysis using a programming language. Visualize data through graphs and tables using example data sets. Handling large data sets.	1, 2
3	Write reports using word processors. Create table of contents and reference citations using software.	1, 2
4	Overview of computer programming.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Compose programming language for advanced statistical analysis of data	1, 2
	CLO2	Compose reports using word processors.	1, 2, 9
	CLO3	Create table of contents and references using citation manager software.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Second Year Second Term

Course Code: 0821 05 FWT 2201	**Year:** Second	**Term:** Second
Course Title: Species Silviculture and Silvicultural Practices		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	The course is a basic forestry course which enables student to explore profile of important tree species. This builds up foundation for forestry operations for improvement of forest stands and maintain productivity.	

Course Contents		**CLOs**
Section A		
1	**Introduction:** Ecological basis of species distribution, Eco-regions of Bangladesh.	1, 2
2	**Species Silviculture:** General description, distribution, environmental requirements, regeneration techniques, growth and yield of important species from hill forest, sal forest, social forest, plantation	1, 2
3	**Silviculture of common species:** Teak, sal, garjan, gamar, mehagani, dhakijam, chapalish, telsur, kanthal, mangium, molaccana, *Eucalyptus camaldulensiss, kadam, koroi, neem. Acacia auriculiformis, Acacia nilotica, Acacia catechu. Dalbergia .sissoo, Cassia siamea, Cassia fistula, Melia. azedarach, Tamarindis indica, Casuarina equisetifolia, Acacia saman, Bombox ceiba, Terminalia arjuna, C.tabularis. Ceiba pentandra*.	1, 2, 9
4	**Silviculture of common mangroves:** General description, distribution, environmental requirements, natural and artificial regenerations, growth and yield of important mangrove plant species: *Heritiera fomes, Avecinia* spp. *Sonneratia* spp. *Bruguiera gymnorrhiza*, *B. sexangula, Ceriops decandara, Excoecaria agallocha, Xylocarpas mekongensis, X. granatum, Amoora cucullata, Cynometra ramiflora*, *Rhizophora* spp, *Nypa fruticans*.	1, 2, 9
Section B		**CLOs**
6	**Silviculture**: definition, objectives and importance.	1, 2, 9
7	**Regeneration:** *Natural Regeneration*: Ecological basis of natural regeneration; natural regeneration by seed, coppice, root sucker and seed; natural regeneration in mangrove, bamboo, hill and sal forest. *Artificial Regeneration*: Seeding and types of seeding, Vegetative propagation, Taungya system; traditional plantation development.	1, 2, 9
8	Natural regeneration problems and prospects in different forests of Bangladesh	1, 2, 9
9	**Tree life:** Ontogeny of a tree, Stages of stand development, Tree classification based on canopy level	1, 2, 9

10	**Tending Operations**: Weeding, cleaning, climber cutting, girdling, pollarding, release cutting, salvage cutting; Thinning: objectives of thinning; thinning plan and schedule; methods of thinning and conditions under which each one is applied; thinning carried in various forests of Bangladesh. Pruning methods and its application	1, 2, 9
11	**Silvicultural practice and wood quality:** Effects of spacing, thinning, pruning, fertilizer etc	1, 2, 9

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand phenology, taxonomy, habitat, climatic requirements, silvicultural characteristics, economic importance of some forest tree species.	1, 2
	CLO2	To understand the important tree species for production and protection forestry in Bangladesh.	1, 2, 9
	CLO3	To comprehend important characteristics of species that are crucial for site suitability and management.	1, 2, 9
	CLO4	To learn about regeneration methods, weeding, thinning, pruning, and other methods in theory and application.	1, 2 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Heywood, V.H. 1976. Plant Taxonomy. 2nd Ed. Sdward Arnold (publisher) Ltd., 25 Hill Street, London WIX 8 LL, UK.
2. Shepherd, K. R. (2012). *Plantation silviculture* (Vol. 22). Springer Science & Business Media.
3. Howard. A.L. 1986. Studies of the Identification of Timbers. International Book Distributions, 9/3, Rajpur Road, Dehra Dun, India.
4. Jones, B. S. & Luchsinger, A.E. 1979. Plant systematics. McGraw Hill Book Company, New York.
5. Rendle, A. B. 1979. The Classification of plowering plants. Volume I & II. Vikas Publishing House (pvt.) Ltd., Vikas House, 20/4, Industrial Area, Sahibabad, Ghaziabad, U.P. India.
6. Troup, R. S (1921). *Silviculture of Indian Trees (vol 1,2,3)*

Course Code: 0821 05 FWT 2202	Year: Second	Term: Second
Course Title: Species Silviculture and Silvicultural Practices Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course is designed for second year students of Forestry and Wood technology discipline tends to make attention on practical knowledge on identification of economically useful woody plants and field level ecology of species that will enable students having practical experience of the theory and apply them in forest condition	

Course Contents		CLOs
Tasks		
1	Field visits to forest areas of Bangladesh for field identification of different tree species at their native environment.	1, 2, 3
2	A simple field study of a natural regeneration in different forests in Bangladesh.	1, 2
3	Schematic practice in thinning operations, especially on determining trees to be cut and basal area to be removed.	1, 2, 3
4	Tending operations in forest plantations.	3, 4

	Upon completion of this course the students will be able to:		Mapping with PLOs
Course Learning Outcomes (CLOs)	CLO1	Identify a variety of common native / exotic tree species with particular reference to different forest types in Bangladesh	1, 2
	CLO2	Understand how to raise nurseries and plantations of optimum quality	1, 2, 9
	CLO3	Assess and conduct tending operations	1, 2, 9
	CLO4	Perform different tending operations.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 2203	**Year:** Second	**Term:** Second
Course Title: Mangroves Ecology and Costal Afforestation		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	This course is designed for the 2nd year students of Forestry and Wood Technology Discipline. Students of this course are expected to learn the structure and function of a mangrove ecosystem

Course Contents		**CLOs**
Section A		
1	**Introduction:** Mangroves, halophytes, mangrove ecosystems, types of mangrove species, biogeography of mangroves, classification of mangrove ecosystem. Conditions for the development of mangrove ecosystems, analysis of the existence of mangrove areas in different parts of the world	1, 2
2	**Mangrove flora and fauna**: Interactions within site factors: interaction between site factors and flora, fauna of the inter-tidal zones.; adaptations of mangrove flora, Sundarbans mangrove ecosystem	1, 2
3	**Mangrove succession and zonation:** Succession on areas of different salinity, retrogression, zonation in mangroves	1, 2
4	**Mangrove biogeochemistry:** Mangrove soil classification; litter dynamics in mangroves, biomass partitioning, global pattern of mangrove biomass, nutrient dynamics in the mangrove ecosystem; pollution in the mangrove habitat; pollutants, sources of pollutants and their effects.	1, 2
Section B		**CLOs**
5	**Introduction:** Coastal areas in Bangladesh, objectives and importance of coastal afforestation in Bangladesh.	3, 4
6	**Delta**: Formation, morphology, delta and river dynamics.	3, 4
7	**Sedimentary structures**: Current formed erosional & depositional structures; flat & graded beds; ripple & tool marks; secondary inorganic structures; sedimentary textures.	3, 4
8	**Coastal land stability issues in the delta areas of Bangladesh:** rapid accretion, erosion, sand smoothening, winnowing of sediment, biotic factors, social and administrative problems. Indicators of land stability and Assessment of coastal land stability	3, 4
9	**Coastal afforestation activities:** Macro-propagation of mangroves, Site-specific matching, Establishing mangrove nurseries, preparation of planting site, time of planting, maintenance of plantations, nursery practices of important mangrove species, problems in coastal afforestation.	3, 4

		Upon completion of this course the students will be able to:	**Mapping with PLOs**
Course Learning Outcomes (CLOs)	CLO1	To be familiar with the conditions for the development of mangrove ecosystem, interaction within site factors, site factors and flora	1, 2
	CLO2	To understand the nutrient dynamics in mangrove ecosystem, pollution in mangrove habitats	1, 2
	CLO3	To acquire the knowledge on the objectives, importance and related activities of coastal afforestation	1, 2
	CLO4	To get knowledge on the process of delta formation and stability of coastal land	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Aksornkoa, S. 1993. Ecology and Management of Mangroves. IUCN, Thailand.
2. Chaudhuri, A.B. & Chudhury, A. (Eds.) 1994. Mangroves of the Sundarbans. Vol.1: India, IUCN.
3. Das, S. & Siddiqi, N.A. 1985. The Mangroves and Mangrove Forests of Bangladesh. Mangrove Silviculture Division Bulletion No. 2 Bangladesh Forest Research Institute, Chittagong.
4. FAO. 1993. Mangrove Area Management Guidelines. Forestry Technical paper No.117.
5. Hussain, Z. & Acharya, G. (Eds.) 1994. Mangroves of the Sundarbans, Vol. 11: Bangladesh, IUCN.

Supplementary Readings

6. Hamilton, L.S. & Snedaker, S.C. (Eds.) 1984. Handbook for Mangrove Area Management, UNDP/IUCN.
7. Hutchings, P. & Seanger, P. 1987. Ecology of Mangroves. University of Queensland Press, Australia.
8. Nasker, K. & Bakshi, D.N.G. 1987. Mangrove Swamps of the Sundarbans. Naya Proksh, India.

Course Code: 0821 05 FWT 2204	Year: Second	Term: Second
Course Title: Mangrove Ecology and Coastal afforestation sessional / Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course is designed for the 2nd year students of Forestry and Wood Technology Discipline. Students of this course are expected to learn the structure and function of mangroves in the field and laboratory.	

Course Contents		**CLOs**
Tasks		
1	Identification of different mangrove plant species of the Sundarbans	1, 2
2	Morphological and anatomical adaptation of mangrove plants	1, 2
3	Field visits to the Sundarbans for studying the site conditions at different parts of the forest and its implication on floral community.	2, 3
4	Field visit to Chittagong, Patuakhali, Noakhali and Bhola to study mangrove nurseries, and plantations. Field visit to plantations under the Green Belt Project to study the problems of coastal afforestation.	2, 3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify the mangrove species	1, 2
	CLO2	Understand different adaptive mechanism of mangrove plants	1, 2
	CLO3	Learn the factors affecting the natural regeneration in mangroves	1, 2
	CLO4	Know the coastal afforestation processes.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 2205	Year: Second	Term: Second
Course Title: Wood Chemistry		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course will fulfill the chemical aspects of wood and other lignocellulosic materials, its influences on properties and uses.	

Course Contents		CLOs
Section A		
1	**Introduction:** Morphology of wood, wood cell wall, chemical composition of wood and non-wood plant fibers.	1, 2
2	**Carbohydrate chemistry:** Structure and properties of cellulose, hemicelluloses and pectin. Cellulose derivatives.	1, 2
3	**Lignin chemistry:** Lignin structure and properties, lignin carbohydrate networks	2, 3
4	**Extractives and Inorganic compounds:** Types, properties and uses of extractives; properties and functions of inorganic compounds	2, 3
5	**Progressive changes in chemical composition:** decayed wood, enzymatic degradation	2, 3
Section B		**CLOs**
6	**Chemical analysis:** Analytical procedures of chemical constituents of wood, bark and other lignocellulogic materials	4, 5
7	**Hydrolysis and combustion of wood:** Concept, types, processes and uses	4, 5
8	**Polymer chemistry:** Definition, types, polymer rheology, polymer structures, thermosetting polymers, thermoplastic polymers, thermoforming, filled and laminated polymers, elastomers, glass, biopolymers, plastic-processing equipment,	4, 5
9	**Properties of Biopolymers:** Structure and chemistry of biopolymer, types, physico-chemical-biological properties; potential uses, degradation mechanism of biopolymers; biocompatibility and compostability.	4, 5

	Upon completion of this course the students will be able to:		**Mapping with PLOs**
Course Learning Outcomes (CLOs)	CLO1	Understand the chemicals, their structure and properties which constituted the wood and other ligno-cellulosic materials.	1, 2
	CLO2	Learn the biosynthesis of wood and wood components.	1, 2
	CLO3	Learn the effects of those chemicals on the properties of wood/other ligno-cellulosic materials.	1, 2
	CLO4	Understand the efficient uses of wood/ other lingo-cellulosic materials or it's modification for various uses.	1, 2
	CLO5	Explain and evaluate biopolymer properties based on their structure (at atomic, nano-, micro- and macro-level) and properties.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment

CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Billamyer, F.W. Jr. (1971). *Textbook of Polymer Science*, 2^{nd} ed. Wiley-Interscience, New York.
2. Farmer, R. H. (1967). *Chemistry in the utilization of wood*. Pergamon Press, Oxford, UK.
3. Fengel, D. and Wegener, G. (1984). *Wood: chemistry, ultrastructure and reactions*. Walter de Gruyter, Berlin.
4. Hons, D. N. S. and Shirshi, N. (2001). *Wood and cellulosic chemistry* (2^{nd} edition). Marcel Dekker Inc. New York.
5. Schey, J. A. (1999). *Introduction to Manufacturing Processes*. McGraw-Hill.

Supplementary Readings

6. Sjostrom, E. (1993). *Wood chemistry: fundamentals and application*. Academic Press, USA.
7. Trelaoar, L. G. G. (1974). *Introduction to Polymer Science*. Wykeham, London.
8. Tsoumis, G. (1969). Wood as raw material: source, structure, chemical composition, growth, degradation and identification. Pergamon Press, Oxford.
9. Williams, H. L. (1975). *Polymer Engineering*. Elsevier, Amsterdam.

Course Code: 0821 05 FWT 2206	**Year:** Second	**Term:** Second
Course Title: Wood Chemistry Sessional		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Practical knowledge about the chemical components of wood and other lignocellulosic materials, their extraction and uses are important to understand wood.	

Course Contents		**CLOs**
Tasks		
1	Determination of carbohydrates.	1, 2
2	Determination of lignin.	1, 2
3	Determination of Extractives.	1, 2
4	Production of cellulose derivatives.	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Synthesize wood and other lingo-cellulosic material's components.	1, 2
	CLO2	Modify for better use of those synthesized chemicals.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce

Course Code: 0716 05 FWT 2207	**Year: Second**	**Term: Second**
Course Title: Aerial Photogrammetry and Remote Sensing		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course is designed for the 2nd year students of Forestry and Wood Technology discipline. Students of the course are expected to learn and understand natural resource management with the fundamentals of spatial data acquisition from airborne and spaceborne sensors. It will provide an introduction into the theory of spectral reflectance properties of vegetation, the principles of photographic analysis and aerial photo-interpretation and new advances such as LIDAR, SAR etc.	

Course Contents		**CLOs**
Section A		
1	**Introduction**: Definition; history and development of aerial photography, remote sensing and GIS in forestry; Application of Aerial photogrammetry and remote sensing in forestry.	1, 2
2	**Aerial Photographs**: Geometry of aerial photographs; Vertical and oblique photograph, stereoscopic vision, parallax, photo scale, flight planning, Photo Mosaic.	1, 2
3	**Height and area measurement**: Object height measurement on aerial photograph, object count, area measurement, Errors and uncertainties in aerial photogrammetry.	2, 3
4	**Photo interpretation**: Principles and elements of photographic image interpretation.	2, 3
5	**Coordinate Systems**: Datum, Geographic and Projected Coordinate system, Global Positioning System.	2, 3
Section B		**CLOs**

6	**Fundamentals of Remote Sensing**: Physical principles of remote sensing, Remote sensing signals, electromagnetic spectrum, Spectral signature, Spatial, temporal and spectral Resolution.	4, 5
7	**Interactions**: Atmospheric absorption, scattering, reflection and transmission of solar radiation, Interaction of EMR with earth surface.	4, 5
8	**Satellites and sensors**: Remote sensing satellites. Orbit characteristics, Sensor characteristics, scanning mechanics and data acquisition.	4, 5
9	**Satellite Images and its processing**: Structure of satellite data, error & accuracy of satellite images, pre-processing and processing techniques, Image Enhancement techniques and corrections.	4, 5
10	**Satellite image analysis**: Image classification, supervised and unsupervised image classification, Vegetation index in remote sensing.	4, 5
11	**Microwave Remote Sensing**: Concept of RADAR systems, SAR and SLAR, Concept of LiDAR system, Concepts of thermal remote sensing.	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Comprehend the issues related to geometry of aerial photograph	1, 2
	CLO2	Measure the height and area of objects from aerial photograph	1, 2, 9
	CLO3	Be familiar with the photo interpretation techniques	1, 2, 9
	CLO4	Learn the fundamentals of remote sensing and GIS	1, 2,9
	CLO5	Understand Satellite image processing, corrections and analysis for forestry application	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Paine, D.P. and Kiser, J.D. (2012) Aerial Photography and Image Interpretation (Third Edition), John Wiley & Sons, Inc.

2. Bhatta, B. (2008) Remote Sensing and GIS (Second Edition), Oxford University Press
3. Konecny, G. (2014) Geoinformation: Remote Sensing, Photogrammetry, and Geographic Information Systems, CRC Press
4. Elachi, C. and Zyl, J.V. (2006) Introduction to The Physics and Techniques of Remote Sensing, John Wiley & Sons, Inc
5. Sharma, M.K. (1986) Remote Sensing and Forest Survey. International Book Distributors, Dehradun, India.

Course Code: 0716 05 FWT 2208	**Year: Second**	**Term: Second**
Course Title: Aerial Photogrammetry and Remote Sensing Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course provides understanding of tools and methods of aerial photogrammetry, Remote sensing and GIS to analyse the image from aerial photogrammetry and Remote sensing.	

Course Contents		**CLOs**
Tasks		
1	Orientation of aerial photographs for stereo viewing.	1, 2, 3
2	Object height and area measurement from aerial photograph	1, 2
3	Satellite image download	1, 2
4	Image pre-processing and analysis (classification)	1, 2, 3
5	Use of GPS machine, data acquisition and integration in GIS software	4, 5
6	Visiting to different departments of SPARRSO, Dhaka and RIMS unit of Bangladesh Forest	4, 5
7	Preparing map and submitting reports	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Take aerial photograph and analysis of this photo	1, 2
	CLO2	Understand the methods of measuring object height and area	1, 2, 9
	CLO3	Download Satellite images any analyse the image	1, 2, 9
	CLO4	Use GPS	9
	CLO5	Prepare map with aerial photo and satellite image	9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO5	Lab works and Presentation	Report Assessment and viva voce

Course Code: 0716 05 FWT 2209*	Year: Second	Term: Second
Course Title: Soil Conservation and Watershed Management		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): Optional		
Rationale	Soil conservation and watershed management is an important field of forestry education. Proper understanding of soil conservation and watershed management plays pivotal role in natural resource like forest management. This particular course will offer opportunities to learn major issues of soil degradation and the relevant conservation measures, estimation of loss, soil conservation for watershed area, planning and management of watershed.	

Course Contents		CLOs
Section A		
1	**Introduction:** Definition and importance of soil erosion, Global context of soil erosion, spatial and temporal variation of soil erosion, soil erosion in Bangladesh.	1, 2
2	**Soil Erosion**: Agents and types of soil erosion, Processes and mechanics of erosion, factors influencing erosion, effects of erosion.	1, 2
3	**Estimate of soil erosion**: Field and laboratory measurement of soil erosion, universal soil loss equation to estimate water erosion, estimating wind erosion losses	2, 3
4	**Soil conservation techniques:** Aims and principles of soil conservation and erosion control, Overview and Classification of conservation techniques, Biological conservation techniques, Agronomic conservation measures, Agroforestry as a conservation techniques, Mechanical methods, Conservation by soil management.	2, 3
5	**Restoration of eroded and degraded soil:** Definition features and scope of restoration of degraded soil, Types of degraded soil, restoration measures for degraded soil.	2, 3
Section B		**CLOs**
6	**Introduction**: Watershed-Definition concept, Importance of watershed, causes and results of watershed deterioration. Basic characteristics, Watershed delineation, watershed divide.	4, 5
7	**Watershed Hydrology:** Concept; Basic hydrologic processes with special reference to forest hydrology, precipitation interception, infiltration, evaporation and transpiration, runoff, sub-surface water, ground water, stream order & stream flow water budget and its application.	4, 5
8	**Watershed Management**: Introduction, principles and objectives of watershed management.	4, 5
9	**Watershed planning:** Organization and procedure; data requirements for watershed planning.	4, 5

10	**Integrated watershed management**; problems in relation to watershed development; need for integrated watershed management study in Bangladesh.	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Perceive the concept and importance of soil conservation	1, 2
	CLO2	Identify the major cause and processes involved in an eroded site	1, 2
	CLO3	Understand the process of estimating soil erosion rate of an area	1, 2
	CLO4	Choose different soil conservation measure for soil eroded area	1, 2
	CLO5	Explain watershed management concepts and its importance in forests.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Morgan, R.P.C. (2005) Soil Erosion and Conservation (Third Edition), Blackwell Publishing.
2. Dvorak, J. and Novak, L. (1994) Soil Conservation and Silviculture, Elsevier
3. Blanco, H. and Lal, R. (2008) Principles of Soil Conservation and Management, Springer
4. Binkley, D. and Fisher, R.F. (2013) Ecology and Management of forest soil by (4th Edition). Wiley and Blackwell
5. Schult, A. and Ruhiyat, D. (1998) Soils of Tropical Forest Ecosystem by. Springer (1998)

Supplementary Readings

6. Beattie, B.B. (1979) Watershed Conditions and Watershed Research needs, Chittagong Hill Tracts. Project Report No.2. Development of the East Pakistan Forest Research Institute, Chittagong, UNDP/FAOBGD/72005, Forest Research Institute, Chittagong, 22 pp.

7. Gustafson, A.F. (1937) Conservation of the Soil. NcGraw Hill Book Company Inc., 312 pp.
8. Khan, L.R. (1991) Watershed Management. UNDP/FAO Project BGD/85/011 IFCU and FAO Rome, 307 pp.
9. Kohnke, H. and Bertrand, A.R. (1959) Soil Conservation. McGraw Hill Book Company, Inc. 298 pp.
10. Sopher, C.D. and Baird, J.V. (1982) Soils and Soil Management. Prentice-Hall Inc., 312 pp.
11. Wouters, H.J. and Shrostha, K. (1985) Runoff and Soil Loss Studies in the Kulekhani Watershed. FO: DP/NEP/80/029. Working Paper No. 3.Dept. Soil Conservation and Watershed Management. Watershed Management and Conservation Education Project Nepal. His Majestys Government of Nepal, UNDP/FAO.
12. Young. A. (1989) Agroforestry for Soil Conservation. CAB International, 276 pp.

Course Code: 0716 05 FWT 22010*	**Year: Second**	**Term: Second**
Course Title: Soil Conservation and Watershed Management Sessional/Fieldwork		
Course Status: Optional		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This particular course will offer opportunities to learn practically the major issues of soil degradation and the relevant conservation measures, estimation of loss, soil conservation for watershed area, planning and management of watershed.	

Course Contents		**CLOs**
Tasks		
1	Visiting to different watershed areas of Bangladesh	1, 2, 3
2	Preparing and submitting reports on observations on problems and mitigation strategies	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Measure the process of estimating soil erosion rate of an area	1, 2
	CLO2	Identify the major cause and processes involved in an eroded site	1, 2
	CLO3	Make appropriate mitigation measures on watershed management and soil conservation	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0542 05 Stat 2251	**Year: Second**	**Term: Second**
Course Title: Statistics		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	Statistics is the science of collection, presentation, analysis and interpretation of numerical data for the logical analysis in predicting and forecasting statistical models where one can improve the quality of data with the design of experiments and survey sampling. Thus, the students of this course are expected to learn and understand the concept of basic and applied statistics.

Course Contents		**CLOs**
Section A		
1	**Introduction:** Definition; history; functions; scope; limitations and the need of statistical knowledge in forestry.	1, 2
2	**Some basic concepts:** Variable and constant, population and sample, accuracy and precision, survey and experiments, tabulation, frequency distribution.	1, 2
3	**Collection of Data and Classification:** Definition and concept; objectives of data collection; nature of data; categories of data; data collection methods; types of data classification.	2, 3
4	**Measures of central tendency:** Definition and concept; mean or average (arithmetic, weighted arithmetic, harmonic, geometric, combined); median; mode; empirical relationship between averages	2, 3
5	**Measures of dispersion, skewness and kurtosis:** Definition and concept; characteristics of good measures of dispersion; types of dispersion (absolute and relative); range and coefficient of range; mean deviation and coefficient of mean deviation; standard deviation and coefficient of variation; moments; skewness and coefficient of skewness; kurtosis and measures of kurtosis.	2, 3
Section B		**CLOs**
6	**Probability and Probability distribution:** Elementary theory and laws of probabilities; Binomial, Poisson's and normal distribution; properties and their applications.	4, 5
7	**Sampling:** Definition and concept; importance and objective; types; simple random, stratified and systematic; uses and standard error of estimates; sample size; sampling error; non-sampling errors.	4, 5
8	**Tests of Significance:** Hypothesis; importance of hypothesis; steps of testing hypothesis; level of significance; region of rejection; paired and unpaired t-tests; Chi-square test; Wilcoxon test; Mann-Whitney test; Kruskal-Wallis test; Friedman test; analysis of variance	4, 5

9	**Correlation and Regression:** Definition and concept; types; significance test of correlation coefficient; principle of least squares method; assessing the simple and multiple linear regression line and their test of significance; coefficient of determination; uses of regression analysis in forest research.	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand the basic concept and principle of statistics	1, 2
	CLO2	Implement the applied aspects of statistics in forest research and management	1, 2, 9
	CLO3	Find appropriate sampling techniques and design of experiment in research	1, 2, 9
	CLO4	Test of hypotheses, and show how to conduct statistical tests.	1, 2 6, 7
	CLO5	Choose methods for examining the relation between a response or dependent variable and one or more predictor or independent variables.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Zar, J. H. (2010). Biostatistical analysis Pearson Prentice-Hall. Upper Saddle River, NJ.
2. Gomez, K. A., & Gomez, A. A. (1984). Statistical procedures for agricultural research. John Wiley & Sons.
3. Jayaraman, K. (2000). A statistical manual for forestry research (pp. 1-231). FORSPA. FAO, Bangkok.
4. Rice, J. A. (2006). Mathematical statistics and data analysis. Cengage Learning.

Supplementary Readings

5. Crawley, M. J. (2012). The R book. John Wiley & Sons.
6. Ali, M.A. 1973: Theory of statistics (Vol. I. & II), Dhaka Book Mart, 30, Banglabazar, Dhaka.

Course Code: 0542 05 Stat 2252	Year: Second	Term: Second
Course Title: Statistics Sessional		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	The students of this course are expected to learn, understand the concept of basic and applied statistics at the same time practice different statistical tools using example data by hand through simple calculator as well as statistical software, such as Excel, SPSS and R .	

Course Contents		CLOs
Tasks		
1	Use a sample data set (e.g. DBH of 100 trees) to produce a frequency diagram having 12 to 20 bin ranges.	1, 2
2	Practice different central tendency, e.g. mean, median, mode, skewness, kurtosis etc.	1, 2, 3
3	Practice different tests of Significance, and correlation and regression with example datasets using hand calculator and computer aided software	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Acquaint with basic understanding of statistics	1, 2
	CLO2	Use different statistical tools with relevant dataset both by hand calculator and statistical software, such as Excel, SPSS and R.	1, 2, 9
	CLO3	Apply the basic concept and principles of statistics practically in drawing statistical inferences through data analysis and hypothesis testing.	6, 7, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Third Year First Term

Course Code: 0821 05 FWT 3101	**Year:** Third	**Term:** First
Course Title: Silvicultural Systems		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	The course will make students understand the basic processes of natural and plantation forest development and management in order to achieve the objectives of conservation forestry and production forestry.

Course Contents		**CLOs**
Section A		
1	**Silviculture**: definition, objectives and importance.	1, 2
2	**Silvicultural Systems**: Classification of silvicultural systems; silvicultural systems practiced in the forests of Bangladesh and other tropical countries.	1, 2
3	**Silvicultural Systems in practice**: The clear – cutting system; general description, size, form, and arrangement of coupes, protection against weed; cutting sections, form and arrangement of coupes in hilly country; clear cutting with artificial and natural regenerations; strip-like clear cutting; progressive felling in alternate strips; advantages and disadvantages of the clear cutting systems.	1, 2
4	**Shelterwood systems**: General characteristics & modifications of the system, the uniform system, the group system, the irregular shelterwood system, strip system, the tropical shelterwood system.	1, 2
5	**The selection system**: General description, felling and regeneration, the felling cycle, the structure of the growing stock regulating yield and their advantages and disadvantages; modifications of the system.	1, 2
6	**The coppice system**: General description, production of shoots, method of cutting, season of cutting, rotation and produce, thinning coppice, special forms of coppice, Basket willow coppice. Advantages and disadvantages of the coppice. Modification of the system.	1, 2
7	**The coppice selection system**: General description, Advantages and disadvantages. Formulating silvicultural system for a particular forest.	1, 2
Section B		**CLOs**
6	**Plantation forestry:** Definition, Types of plantation forestry, Role of plantation forestry in meeting the wood demand – Plantation forestry in Bangladesh and abroad, Purpose of plantation, Factors determining scale and rate of plantation, Land suitability and choice of plantation species	3, 4

7	**Forest Nursery:** Types of Nursery, Site selection, site preparation layout, Seed handling, seed treatment, Preparation of growing media, control of nursery pests and diseases, Common types planting materials produced in nursery, Seedling sorting, hardening and preparation of planting materials.	3, 4
8	**Plantation planning:** Site preparation for plantation, Fixing rotation of plantation forestry, Mixed and monoculture, Planting programme, time of planting, planting pattern, spacing, planting method.	3, 4
9	**Plantation management:** Silvicultural systems, Nutritional dynamics and irrigation of plantation, Mechanization in plantation, Protection and after care of plantation, tending operation for quality wood production,	3, 4
10	**Pest management:** Management of pests and diseases, plantation sanitation.	3, 4
11	**Case studies:** Important forest plantations in Bangladesh and abroad.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Differentiate among different silvicultural systems applicable in different forest conditions	1, 2
	CLO2	Devise appropriate silvicultural system for a particular forest	1, 2
	CLO3	Establish and manage forest nursery and plantations for particular objectives.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Troup, R. S. (1921). *The silviculture of Indian trees* (Vol. 1, 2, 3).
2. Shepherd, K. R. (2012). *Plantation silviculture* (Vol. 22). Springer Science & Business Media.
3. Smith, D. M., Larson, B. C., Kelty, M. J., & Ashton, P. M. S. (1997). *The practice of silviculture: applied forest ecology* (No. Ed. 9). John Wiley and Sons, Inc.
4. Evans, J. (Ed.). (2009). *Planted forests: uses, impacts and sustainability*. Cabi.
5. Panwar, P., & Bhardwaj, S. D. (2006). *Practical Manual on Plantation Forestry*. Scientific Publishers. Plantation Silviculture (Forestry Sciences) (2013) by K. R. Shepherd

Supplementary Readings

6. Silviculture in the Tropics (2011) Günter, S., Weber, M., Stimm, B., Mosandl, R. (Eds.)
7. Ecological Forest Management (2018) By Jerry F. Franklin, K Norman Johnson and Debora L. Johnson
8. Plantation Silviculture in Europe (1998). By Peter Savill, Julian Evans, Daniel Auclair, and Jan Falck
9. The Practice of Silviculture: Applied Forest Ecology 10th Edition (2018). By Mark S. Ashton & Matthew J. Kelty
10. Silvicultural Systems (1991). By John D. Matthews
11. Multiaged Silviculture: Managing for Complex Forest Stand Structures (2014). By Kevin O'Hara. Oxford University Press.
12. Bravo-Oviedo, A., Pretzsch, H., & del Río, M. (Eds.). (2018). *Dynamics, silviculture and management of mixed forests*. Berlin: Springer International Publishing.
13. Savill, P., Evans, J., Auclair, D., & Falck, J. (1997). *Plantation silviculture in Europe*. Oxford University Press, UK.
14. Kumar, V. (2015). *Nursery and plantation practices in forestry*. Scientific Publishers.
15. Evans, J., & Turnball, J. W. (2004). *Plantation forestry in the tropics: the role, silviculture and use of planted forests for industrial, social, environmental and agroforestry purposes*. Oxford.
16. Chiang, L. K. (Ed.). (2019). *Prospects and Utilization of Tropical Plantation Trees*. CRC Press.
17. West, P. W. (2014). *Growing plantation forests*. Springer-Verlag.
18. O'Hara, K. L. (2014). *Multiaged silviculture: Managing for complex forest stand structures*. Oxford University Press, USA.
19. Suzuki, K., Ishii, K., Sakurai, S., & Sasaki, S. (Eds.). (2006). *Plantation technology in tropical forest science*. Tokyo: Springer.
20. Jain, S. M., & Priyadarshan, P. M. (Eds.). (2009). *Breeding plantation tree crops: tropical species* (Vol. 84). New York: Springer.

Course Code: 0821 05 FWT 3102	**Year:** Third	**Term:** First
Course Title: Silvicultural Systems Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course will make students technically and practically capable of growing and managing natural and plantation forests.	

Course Contents		**CLOs**
Tasks		
1	Field visits to forest areas of Bangladesh for field identification of natural regeneration in different forests in Bangladesh.	1, 2, 3
2	Schematic practice in thinning operations, especially on determining trees to be cut and basal area to be removed.	1, 2
3	Tending operations in forest plantations.	1, 2

4	Different nursery operation	1, 2, 3
5	Field trip to Sal forest, the Sundarbans, hill forest & reed forest to observe coppice, selection, clearcutting and pollarding systems respectively	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Raise nurseries and plantations of optimum quality	1, 2
	CLO2	Assess and conduct silvicultural operations	1, 2, 9
	CLO3	Assess natural regeneration and forest development under different silvicultural systems.	1, 2, 9
	CLO4	Assess and conduct different tending operations	

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO4	Field visit to different forests and relevant organizations	Report Assessment and viva voce

Course Code: 0821 05 FWT 3103	**Year:** Third	**Term:** First
Course Title: Forestry Extension and Community Organization		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Forestry extension is a vital tool to expand forest resources in a forest resource poor country. It facilitates to protect its declining forest resources and their services as well as to ensure the optimum use of forest resources. Therefore, forestry extension maintains both efficiency and equity in forestry development of a country particularly developing country. Community organizations are the powerhouse of forestry extension. Consequently, this course has been designed to provide students a general introduction of concept, nature and perspectives of forestry extension with particular reference to Bangladesh.	

Course Contents		**CLOs**
Section A		
1	**Basic concepts and Principles of forestry extension**: Definition, components, types, goals of forestry extension, principles, nature and roles of forestry extension in forestry and community development	1, 2

2	**Extension education and teaching-learning process**: Basic attributes of learning, characteristics and rules of learning, social learning, adoption, motivation and diffusion process, characteristics and roles of adopters	1, 2
3	**Principles of Extension communication and strategies**: communication process and strategies, message treatment, nature of extension communicators and their roles in extension	3, 4
4	**Forestry extension teaching method**: Various teaching methods applied in the extension process, advantages and disadvantages of individual, group and mass methods	3, 4
5	**Forestry Extension Program planning and Development**: Methods of extension and development; Blue-print Vs the learning approach to program development; steps and processes of program planning, program development cycle.	3, 4
6	**Audio-visual Aids to Extension Teaching**: Classification of Audio-visual methods, Choice of Audio-visual Aids; Audio Aids, Visual Aids.	3, 4
Section B		**CLOs**
7	**Organizational and Institutional Development in Forestry Extension**: Different approaches for working with people. Working with local leaders, Human resources development; Group dynamics.	4, 5
8	**Community:** Definition, community values, norms and institution**.**	4, 5
9	**Common pool resources:** Tragedy of the commons, invisible and bundle theory: basics; VCF	4, 5
10	**Community organization for Forestry Extension**: Importance of community organizing in forestry and rural development; Community organizing strategies and techniques; institution; instruments to support effective community organizing; best practices and lesson learned for community organizing in the forestry in Bangladesh and other Asian countries; comparative study on forestry extension	4, 5
11	**Participatory appraisal for community development:** Concepts and definition of PA; Participatory Rural Appraisal (PRA); Rapid Rural Appraisal (RRA) and Social Impact Assessment (SIA). Theory, Principles, applications; Methods, tools and techniques of RRA and PRA.	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand the general concepts, elements and components of forestry extension	1, 2
	CLO2	Know and apply various tools, methods and approaches of forestry extension	1, 2
	CLO3	Organize the local communities for forestry extension activities	4, 5
	CLO4	Know the concepts of RRA and PRA, tools and techniques in general	4, 5

	CLO5	Apply these tools and techniques in field practice	4, 5

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Magno V. C. (1986) "Forestry Extension Hand Book" FAO/UNDP/BGD/81/028 Field documents –2 Dhaka.
2. FAO (1978). Forestry for local community development. FAO Forestry Paper No. 7.
3. Haq, N. "Working with people" Lecturer Notes prepared and discussed during the community Forestry development course held in 1984 at the RDA, Bogra Under the auspices of the project BGD/81/028.
4. Magno, V.C. (1982) "Forest Extension Methods" "Lecturer Notes prepared for GCP/LES/SWE-Forestry Training and Development. FAO/SIDA project, Lestho, Southern Africa.
5. FAO (1987). Forestry Extension methods "FAO Forestry Paper No. 80.
6. FAO (1986)" Forestry Extension organization" FAO Forestry papers No 66.
7. FAO (1985). Monitoring and evaluation of participatory forestry projects. FAO Forestry Paper No-60.

Supplementary Readings

8. Rebugio Lucreacio. L (1990) Readings on Rural Development, Social Forestry and Forestry Extension. UNDP/FAO/BGD/85/011/Field document No. 23 volume 2.
9. JICA (2008). Agricultural Extension Methodology: A Reference Manual.
10. Fernandaz, C. C., Sudhagar, R. J., Balasubramaniam, P. and Sekar, I. (2021). A Textbook on Forestry Extension. IndiaMart, India. ISBN 9788194377672.
11. Brown, M. J. (2007). Building Powerful Community Organizations: A Personal Guide to Creating Groups that Can Solve Problems and Change the World. Link (free access): https://media.oiipdf.com/pdf/cbe73a7c-7006-45e7-82b9-9b878460496d.pdf
12. Kandzior, A., and Rivas, E. (2014). Forestry Extension as a Work Approach for Forestry Programs and Projects. In L. Pancel & M. Köhl (Eds.), Tropical Forestry Handbook (pp. 1-20). Berlin, Heidelberg: Springer Berlin Heidelberg.
13. Sim, D. and Hilmi, H. A. (1987). Forestry extension methods. FAO Forestry Paper 80. Link (free access): https://www.fao.org/3/ap461e/ap461e.pdf

14. FAO (1986). Forestry Extension Organization. FAO Forestry Paper 66. Link (free access): https://www.fao.org/3/an796e/an796e00.pdf
15. Jha, L. K. and Sarma, P. K. S. (2008). A Manual of Forestry Extension Education. APH Publishing, India.
16. Falconer, J. (1987). Forestry Extension: A Review of The Key Issues. Network Paper 4e. Link (free access): https://cdn.odi.org/media/documents/920.pdf

Course Code: 0821 05 FWT 3104	**Year:** Third	**Term:** First
Course Title: Forestry Extension and Community Organization Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course helps student to understand the concept, nature and perspectives of forestry extension in Bangladesh	

Course Contents		**CLOs**
Tasks		
1	Visit to various social forestry regions to demonstrate forestry extension activities	1, 2, 3
2	Application of various Rural appraisal tools and techniques i.e. RRA , PRA, SIA	1, 2
3	To determine how local people are being organized into groups for extension activities by Forest Department or NGOs	1, 2
4	To observe different methods (individual, group, mass method) of forestry extension in the field.	1, 2, 3
5	Best practices of extension activities by other agencies (DAE, NGOs)	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify various tools and methods used in forestry extension	1, 2
	CLO2	Organize a community	4, 5
	CLO3	Conduct RRA and PRA	4, 5

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 3105*	**Year: Third**	**Term: First**
Course Title: Forest Entomology and Pest Management		
Course Status: Optional		
Credit: 2.0		
Prerequisite(s): None		
Rationale	Natural and plantation forest are often infested by various insects and pests. Sometimes it is crucial to know their biology and management to reduce the loss of forest products. Students of the course are expected to learn and understand the issues related to forest insects, their role and management to improvement forest health.	

Course Contents		**CLOs**
Section A		
1	**Introduction to Forest Entomology:** Introduction; arthropod classification and diversity.	1, 2
2	**Insect structure and life processes:** Basic facts about insects, Insect Body, Maintenance and locomotion, sensing the environment and integrating activities, Insect reproduction	1, 2
3	**Insect growth and development:** Molting and Metamorphosis in insects, Polymorphism and Voltinism, seasonal adaptation	1, 2
4	**Insect classification:** Classification of forest insects upto order and their characteristics.	1, 2
5	**Insect Behavior:** Behavioral pattern, Behavioral Modifications, Tropism, Symbiosis, Insect defense, Insect communication, Reproductive behavior of Insects, Social Insects.	1, 2
6	**Insect Ecology**: Ecological role of insect pests, Determinants of insect abundance, Dynamics of insect life system.	1, 2
7	**Beneficial Insects:** Major beneficial insects with its prey, Biology and management of Honey bee, Silk worm, Lac insects to increase forest productivity.	1, 2
Section B		**CLOs**
8	**Pest Surveillance and Monitoring:** Assessing pest abundance and loss of forest stand through sampling, monitoring and assessing risk of insect outbreaks.	3, 4
9	**Pest Management Decision:** Categories of forest pest, damage and injury concept, economic aspects of pest management decision.	3, 4
10	**Pest Management and control:** Legal, Mechanical, Cultural, Biological, Physical, Chemical and Integrated Pest Management in relation to forest ecosystem	3, 4
11	**Nature of Damage and Management of major forest pest:** Types of damages and symptoms pests of forest seeds, forest nursery and standing trees of natural and plantation forest. Insect pests of freshly felled trees, finished timbers and their management.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Recognize the many types of forest insects and pests.	1, 2
	CLO2	escribe the biotic and abiotic interactions between important forest insect pests and the environment.	1, 2
	CLO3	Incorporate biological information about forest insect pests into long-term natural resource management plans.	1, 2
	CLO4	Outline treatments and strategies for mitigating the negative effects of forest pest insects on resource values.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Fundamentals of Entomology by D L Sana. Chayanica, Dhaka, 2007.
2. Borror, D.J. and Delong, D.M. An introduction to the study of insects.
3. Bosak, W. Forest pest of Bangladesh and their control. Bulletion No.1, BFRI publication.
4. Chapman, R.F. The insects' structure and function.
5. Findley, W.P.K. 1967. Timber pests and diseases. Pragman Press, 280 pp.

Supplementary Readings

6. Gullan, P.J. and Cranston, P.S. (2005) The Insects: An Outline of Entomology. Blackwell Publishing, Oxford, UK
7. Graham, S.A. & Knight, F.B. 1965.Principles of Forest Entomology, McGraw Hill Book Company.
8. Berryman, A. (1986) Forest Insects: Principles and Practice of Population Management. Plenum Press, New York.
9. Leather, S. (2005) Insect Sampling in Forest Ecosystems. Blackwell Publishing, Oxford, UK

Course Code: 0821 05 FWT 3106*	**Year: Third**	**Term: First**
Course Title: Forest Entomology and Pest Management Sessional/ Fieldwork		
Course Status: Optional		
Credit: 1.0		
Prerequisite(s): None		
Rationale	This course is designed for the 3rd year students of Forestry and Wood Technology discipline. Students of the course are expected to learn and understand assessment process of insect abundance for forest monitoring and their management aspects.	

Course Contents		**CLOs**
Tasks		
1	Methods of sampling and colleting insect from a forest.	1, 2, 3
2	Collection and preservation of Insects.	1, 2
3	Identification of forest pests with its damage symptoms**.**	1, 2
4	Formulation and application of pesticides and safety precautions**.**	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Sampling and collecting insects from the forest and assess pest abundance to estimate pest outbreak risk.	1, 2
	CLO2	Identify insects up to order with its merits.	1, 2
	CLO3	Formulate pesticides and spray it safely.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Learning Materials

Recommended Readings

1. Leather, S. (2005) Insect Sampling in Forest Ecosystems. Blackwell Publishing, Oxford, UK
2. Berryman, A. (1986) Forest Insects: Principles and Practice of Population Management. Plenum Press, New York.

Course Code: 0821 05 FWT 3107	Year: Third	Term: First
Course Title: Forest Mensuration and Inventory		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	Students are expected to learn the techniques of measuring individual trees and quantifying the available resources in a forest.

Course Contents		CLOs
Section A		
1	**Measurements**: The role of Mathematics and Statistics in Forest Mensuration and Inventory; definition of terms, accuracy in calculation, errors of measurement and the measurement of variation, the choice of where and how to measure forest produce.	1, 2
2	**Instruments and principles used in measuring trees**: Principles and methods for measurement.	1, 2
3	**Measuring single trees**: Diameter, cross-sectional area, height, bark, crown, leaf area index and log; Form and shape of trees, taper functions and equations.	3, 4
4	**Measurement and tree bole volume**: Construction and testing of volume table and biomass equation.	3, 4
5	**Tree growth:** Simple expressions of growth rates, calculations of growth at constant rates, pattern of growth and stem analysis.	3, 4
6	**Measuring tree crops:** Parameters describing even-aged crops of one species; tree density, diameter, basal area, height, crown size & canopy closure, standing volume, biomass, descriptions of even-aged crops of more than one species; parameters describing uneven-aged crops of several species; the diameter and basal area frequency distribution.	3, 4
Section B		**CLOs**
6	**Forest inventory:** Definition, types and objectives of forest inventory; recurrent forest inventory.	5, 6
7	**Forest inventory planning:** Forest inventory planning and procedure; application of remote sensing and GIS technique in forest inventory planning and design.	5, 6
8	**Growth and yield**: Estimation of growth and yield, site classification based on MAI and CAI, site index.	6, 7
9	**Statistical procedures in forest inventory**: sampling designs commonly applied in forest inventories- random, systematic, cluster, two phase, multistage and stratified sampling designs; principles and application of point sampling; Point Centered Quarter Method (PCQM); Variable Area Transect (VAT).	6, 7

10	**Sample plot design**: Choice of plot size and shape; permanent sample plots (PSP)	6, 7
11	**Data processing**: Collection of data from field, processing and report writing.	6, 7

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Handle various forest measurement tools and instruments	1, 2
	CLO2	Find suitable sampling designs for forest inventory and apply sampling techniques in forest inventory.	1, 2, 3
	CLO3	Apply the techniques of tree and stand measurements, and develop capability of statistical analysis of forest inventory data.	1, 2, 3
	CLO4	Build tree level allometric equations for stem volume, biomass and carbon stock estimation and apply allometric models for standing volume estimation before harvesting	5, 7, 9
	CLO5	Calculate current annual increment and mean annual increment of trees in plantations.	1, 2
	CLO6	Prepare volume table and yield table for field level applications.	1, 2 9
	CLO7	Apply knowledge of forest mensuration and inventory in forest resource management.	8, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO6	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO7	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Burkhart, H. E., Avery, T. E., & Bullock, B. P. (2018). Forest measurements. Waveland Press.
2. West, P. W. (1015). Tree and forest measurement. Berlin: Springer.
3. Avery, T. E., & Burkhart, H. E. (2015). Forest measurements. Waveland Press.
4. Pretzsch, H. (2009). Forest dynamics, growth, and yield. In Forest dynamics, growth and yield (pp. 1-39). Springer, Berlin, Heidelberg.
5. Chaturved, A. N. and Khanna. L. J. 1982. Forest menstruation. International Book Distributors, 9/3 Rajpur Road, Dehara dun, India.

Supplementary Readings

6. GoB. 2020. Tree and Forest Resources of Bangladesh: Report on the Bangladesh Forest Inventory. Forest Department, Ministry of Environment, Forest and Climate Change, Government of the People's Republic of Bangladesh.
7. Temu, A.B. 1990. Forest Menstruation and Inventory. UNDP/FAO/BGD/85/001 Project, Field Document No. 3 Development of professional education in the forestry sector of Bangladesh. Institute of forestry, Chittagong University and FAO Rome.
8. FAO. (1981) Manual of Forest inventory. FAO Forestry paper 27. http://www.fao.org/3/a-ap358e.pdf

Course Code: 0821 05 FWT 3108	**Year: Third**	**Term: First**
Course Title: Forest Mensuration And Inventory Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Students are expected to learn the techniques of measuring individual trees and quantifying available resources in a forest.	

Course Contents		**CLOs**
Tasks		
1	Demonstration and practice of instrument commonly used in forest mensuration.	1, 2, 3
2	Field exercises in tree and stand measurements in the mangrove/ hill forest, sal forest.	1, 2
3	Develop a stem volume allometric equation for an important tree species in a plantation or natural forest and apply the model for standing volume estimation and construct a volume table using different software.	3, 4, 5
4	Preparation of an inventory plan. Planning and executing an inventory in natural forests at Sundarbans, Chittagong, and Sylhet forest.	3, 4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Work in diverse field conditions in forests	1, 2
	CLO2	Prepare a forest inventory plan	1, 2, 3

	CLO3	Develop allometric models for individual trees using different software	3, 6, 7
	CLO4	Apply allometric models for standing volume, biomass and carbon stocks estimation	6, 7, 8
	CLO5	Apply the gained knowledge in forest management	6, 7, 8

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Lecture and Presentation	Report Assessment and viva voce
CLO5	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0521 05 FWT 3109*	**Year:** Third	**Term:** First
Course Title: Environmental Impact Assessment		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Students are expected to learn the basics of EIA and its implications in forest resource management.	

Course Contents		**CLOs**
Section A		
1	**Environment and Environmental Impact Assessment** -Definition of related terms, objective and importance of EIA; history of EIA in Bangladesh; strategic environmental assessment (SEA).	1, 2
2	**EIA Process:** The EIA process; Initial environmental examination (IEE); Principle in managing an EIA; resources needed for EIA; Public participation in EIA, Cumulative environmental effects, Monitoring and post-auditing.	1, 2
3	**Impact prediction, evaluation and mitigation:** Predication and Assessment of Impacts on Physical Environment (Geology, soils, minerals, Climate, Water Resources, Water Quality, Air, Noise), on biological Environment (Terrestrial Ecosystems, Wetland Ecosystems, Aquatic Ecosystems, Threatened and Endangered Species), on Human Resources (Demographics, Economics, Land Use, Infrastructure, Archaeological, Historic, Aesthetics, Safety – Hazardous waste).	3, 4
4	**EIA and Environmental Management**: EIA-vital tool for environmental management and importance for Bangladesh Environment.	3, 4
5	**Environmental statement (ES)**: The Planning procedures for preparing an environmental statement (ES); economic analysis and environmental	3, 4

	assessment; relation between EIA, feasibility study and development of a good design, role of EIA in project planning & implementation.	
6	**Schedules of projects requiring EIA**: Projects requiring EA in every case (sehedule-1 projects), projects requiring EA only in some cases (sehedule-II projects); indicative criteria and thresholds for identifying sehedule-2 projects requiring EA; checklist of matters to be considered for inclusion in an environmental statement	4, 5
Section B		**CLOs**
7	**Life Cycle assessment (LCA):** Introduction, Life Cycle Assessment (LCA), Goal and Scope, Life Cycle Inventory (LCI), Life Cycle Impact Assessment (LCIA), Interpretation and Applications.	4, 5
8	Carbon Footprint, Carbon Footprint Calculation, Social Life Cycle Assessment (SLCA), Materials Flow Analysis (MFA), Life Cycle Costing, International Standards for LCA.	4, 5
9	**EIA and LCA of forestry-related projects**: Background to environmental assessment in forestry; environmental impact assessment of different forestry projects- commercial logging, reforestation, community forestry and products manufacturing; criteria for identifying adverse impacts of forestry developments.	4, 5
10	**EIA and sustainable development**: Bangladesh National Conservation Strategy; background objectives and importance; conservation and sustainable development; environmental strategy for sustainable development in Bangladesh.	4, 5
11	**Main areas of environmental concerns in Bangladesh**: Major environmental problems; National Environmental Management Action Plan (NEMAP) – objectives and background of its development.	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand EIA process and life cycle assessment	6, 7
	CLO2	Identify any project requiring an EIA	6, 7, 9
	CLO3	Identify impacts of any major project on forest ecosystems	6, 7, 9
	CLO4	Find mitigation measure of impacts before implementation of a major development project	6, 7, 9
	CLO5	Contribute to National Environmental Management Action Plan	6, 7, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Arts, J., & Morrison-Saunders, A. (Eds.). (2012). Assessing impact: handbook of EIA and SEA follow-up. Routledge.
2. Glasson, J., & Therivel, R. (2013). Introduction to environmental impact assessment. Routledge.
3. Morris, P., & Therivel, R. (Eds.). (2001). Methods of environmental impact assessment (Vol. 2). Taylor & Francis.
4. Knowler, D., & Lovett, J. (1996). Training manual for environmental assessment in forestry.
5. UNEP, 1988. Environmental Impact Assessment: Basic procedures for developing countinces. UNEP Regional office for Asia and the Pacific, Bangkok, 16 pp.
6. GoB. 1994. National Environment Management Action plan (NEMAP) vol. 11. Mains report. Ministry of Environment & Forest, Govt. of Bangladesh.
7. Timothy, O & Hey, R 1976 Environmental Impact Assessment. Saxon House, Farnborough, UK, 232 pp.

Course Code: 0821 05 FWT 3111	**Year:** Third	**Term:** First
Course Title: Wood Seasoning and Preservation		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Basic knowledge, principles and practices about the seasoning and preservation of wood enables proper utilization of wood.	

Course Contents		**CLOs**
Section A		
1	**Seasoning of wood:** definition, objectives, importance, concepts; moisture travel in wood; rate of drying of wood; moisture driving forces; classification of timber for the seasoning purpose; methods of seasoning; air seasoning: procedure, stacking– horizontal and vertical, air seasoning shed, timber yard for air seasoning, end coating; kiln seasoning: design and operation of kiln, classification – progressive and compartment, kiln schedule; solar kiln; special seasoning methods; status, problems and prospects of wood seasoning in Bangladesh	1, 2
2	**Seasoning defects of wood:** definition; types – warping and rupture; causes, description and minimization of defects.	1, 2

3	**Biodeterioration of wood:** agencies of biodeterioration; factors affecting the growth and survival of fungi in wood; wood destroying fungi: definition, features and micromorphology of brown rot, white rot and soft rot fungi; Wood staining fungi; deterioration caused by bacteria, insects and marine borers.	1, 2
4	**Natural durability:** concepts, causes, variations and classification systems; hazard category.	1, 2
Section B		**CLOs**
5	**Wood Preservative:** definitions; characteristics of good wood preservatives; types of wood preservatives: water borne and oil borne, organic and inorganic, fire retardants; selection of preservative; new generation preservatives, bio-preservatives; health and safety.	3, 4
6	**Preservation of wood:** definition, objectives and benefits; methods of preservative treatments: pressure, non-pressure, sap displacement methods; preparation of materials for preservation treatments; factors affecting penetration and absorption; properties of treated wood; factors influencing performance of wood preservation; economic and environmental aspects of preservative treatments; prospects and problems of preservation of wood in Bangladesh.	3, 4
7	**Accelerated test of wood preservatives:** determining effectiveness of wood preservatives; Laboratory test of toxicity and effectiveness: agar plate test, soil block test, agar block test, accelerated exposure/ field test, accelerated ageing test.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Describe the wood-water relationship and the movement of water at different moisture content.	1, 2
	CLO2	Seasoning of wood using various methods and minimization of seasoning defects.	1, 2, 9
	CLO3	Identify various biodeteriorating agents and how to prevent their attack on wood and wood structure	1, 2, 9
	CLO4	Preservation of wood using appropriate preservatives and the right method of application.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Brown, W.H. (1965). *Introduction to the seasoning of timber*. Pergamon Press, UK.
2. Eaton R.A. and Hale M.D.C. (1993) *Wood: decay, pests & protection*. Chapman & Hall, London, New York.
3. Findlay G.W. (Ed.) (1986). *Preservation of Timber in the Tropics*. Kluwer Academic Publishers, Dordrech.
4. Goodell, B., Nicholas, D.D. and Schultz, P. (2003). *Wood deterioration and preservation: advances in our changing world*. ACS Symposium Series 845, American Chemical Society.
5. Hunt, G. M. and Garratt, G. A. (1953). *Wood Preservation*, 3rd edition. McGraw- Hill, New York, 1953.

Supplementary Readings

6. Keey, R.B., Langarish, T.A.G. and Walker, J.C.F. (2000). *Kiln-drying of lumber*. Springer-Verlog, Berlin.
7. Lantican, C.B. (1989). *Wood seasoning and preservation*. UNDP/FAO Project BGD/85/011, Institute of Forestry, Chittagong University. Chittagong.
8. Milton, F. T. (1995). *The Preservation of Wood*. University of Mennisota, College of natural resources, USA.
9. Nicholas, D.D. (1973). *Wood deterioration and its prevention by preservative treatments: Degradation and protection of wood*, Vol. 1. Syracuse University Press, New York.
10. Prakash, O. and Kumar, A. (2017). *Solar drying technology: concept, design, testing, modeling, economics, and environment.* Springer.
11. Richardson, B.A. (1998). *Wood Preservation*, 2nd edition. E&FN SPON, London.
12. Thompson, R. (2005). The chemistry of wood preservation. Woodhead Publishing Ltd. Cambridge, UK.
13. Zabel, R.A. and Morrell, J.J. (1992). *Wood microbiology: decay and its prevention*. Academic Press, London.

Course Code: 0821 05 FWT 3112	**Year:** Third	**Term:** First
Course Title: Wood Seasoning and Preservation Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Practical knowledge of seasoning and preservation enables to enhance the performance of wood.	

Course Contents	**CLOs**
Tasks	

1	Determination of moisture contents of seasoned and unseasoned wood by different methods, stacking timber for air, kiln and solar drying; operation of kiln including application of kiln drying schedules	1, 2, 3
2	Identification of different kinds of rots, stains and damaged caused by different deteriorating agents.	1, 2
3	Application of preservatives by pressure and non-pressure process and testing penetration and retention of preservatives.	1, 2
4	Procedure of different decay testing methods	1, 2, 3
5	Visit to different wood seasoning & preservation plants (BFIDC, Kaptai and Kalurghat, BFRI, Chittagong and other wood based industries (Nordic, Hatil, RFL etc)	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Explain different drying methods.	1, 2
	CLO2	Identify wood decay and deteriorating agents.	1, 2, 9
	CLO3	Demonstrate different preservatives and preservation methods.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 3113	**Year:** Third	**Term:** First
Course Title: Forest Economics and Forest Product Marketing		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Forests provide a wide variety of inputs as raw materials for industrial production, environmental goods and services, food and water, fuel, medicines, household equipment, building materials for the human kind. Therefore, forest is recognized as an integral part of national economies where the knowledge of economics and marketing is part and parcel. This course is designed for the students to learn and understand the basic of economics and related issues of forest products and services marketing.	

Course Contents		**CLOs**
Section A		
1	**Introduction**: Concept of resource economics, forest economics in aid of forestry decisions.	1, 2
2	**Micro and macro- economic**; their importance and limitations.	1, 2

3	**Theory of consumer behaviour**: The utility analysis, total utility vs. marginal utility, law of diminishing marginal utility; indifference curve approach, assumptions of indifference curve, properties of indifference curve, consumers' equilibrium.	1, 2
4	**Economics of demand and supply**: Law of demand, demand curve, demand schedule and demand function; the law of supply, factors affecting supply, causes of downward supply; equilibrium of supply and demand, changes in the equilibrium price; the concept of elasticity of demand, kinds of elasticity, methods of measuring elasticity.	1, 2
5	**Production theory**: The production of function; the law of variable proportions production theory as applied to forestry.	1, 2
6	**Product pricing**: Nature of cost curves in the short and long runs, relation between marginal cost and average cost curves; the concept of revenue, relation between average revenue and marginal revenue; equilibrium of the firm under perfect competition and monopoly.	1, 2
7	**Measuring national income and national product**: The circular flow and national income; gross national product, calculation gross national product.	1, 2
Section B		**CLOs**
8	**The Market**: Definition, common usage, market period, market structure, and classification of market.	2, 3
9	**Marketing**: Definition, distinction between market and marketing; marketing costs; factors affecting the marketing costs; marketing channel; types of marketing channel; marketing mix; factors determining the marketing mix, sub-mix of marketing mix, marketing efficiency; aspects of marketing efficiency, steps to reduce marketing costs to improve marketing efficiency; marketing functions, stages of marketing function.	2, 3
10	**Marketing research**: Definition, functions, objectives, procedure, classification of marketing research activities, cost of marketing research, importance or role of marketing.	2, 3
11	**Marketing of forest products and services in Bangladesh**: Relevance of marketing in forestry, types of forest produces (goods and services), special features of marketing of forest produces, the scope of marketing of forest products and services, sources of forest produces in Bangladesh, forest markets, and marketable products in Bangladesh, forest produces marketing system, methods of forest produce marketing system, marketing of standing trees by Forest Department.	2, 3
12	**Marketing by public sector corporation in Bangladesh**: Bangladesh Forest Industries Corporation (BFIDC): Philosophy of establishment, objectives, functioning, units, marketing research, export potential, suggestions for improving marketing efficiency; Bangladesh Chemical Industries Corporation (BCIC): Philosophy of establishment, different forest-based	2, 3

	enterprises, marketing strategy, export and marketing research, marketing efficiency.	

	Upon completion of this course the students will be able to:		**Mapping with PLOs**
Course Learning Outcomes (CLOs)	CLO1	**CLO1.** Define, use and apply various technical terms applicable to economics and marketing of forest products and services.	1, 2
	CLO2	**CLO2.** Describe different industries related to marketing of forest products and services.	1, 2, 9
	CLO3	**CLO3.** Understand the marketing of forest products in Bangladesh.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Wagner, J. E. (2012). Forestry Economics: A Managerial Approach. Routledge. ISBN 9780415774765.
2. Kant, S. and Alavalapati, J. (eds.). (2017). Handbook of Forest Resource Economics. Routledge. ISBN 9781138573185.
3. Zhang, D. and Pearse, P. H. (2011). Forest Economics. UBC Press: Vancouver.
4. Baumol, W. J. and Blinder, A. S. (2015). Microeconomics: Principles and Policy (13th Edition). Cengage Learning. ISBN-13: 978-1305280618.
5. Miller, R. L. (2012). Economics Today and Tomorrow (Illustrated Edition). Glencoe. ISBN-13: 978-0078204890.

Supplementary Readings

6. Joshi, M. (2012). Essentials of Marketing. Manmohan Joshi & Ventus Publishing ApS. ISBN 978-87-403-0206-6. Link (Free access): https://irp-cdn.multiscreensite.com/1c74f035/files/uploaded/essentials-of-marketing.pdf
7. Kotler, P., Armstrong, G., Harris, L. C. and He, H. (2019). Principles of Marketing. Pearson: UK.
8. Sinclair, S. A. (1991). Forest Products Marketing. McGraw-Hill College (1St Edition). ISBN-13: 978-0070575462.
9. Hansen, E., and Juslin, H. (2018). Understanding Forest Products Marketing (Chapter 2). In: Hansen, E., and Juslin, H. Strategic marketing in the global forest industries. Link (Free access): https://open.oregonstate.education/strategicmarketing/chapter/chapter-2-understanding-forest-products-marketing/

Third Year Second Term

Course Code: 0821 05 FWT 3201	**Year:** Third	**Term:** Second
Course Title: Biocomposites And Adhesion Technology		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	Biocomposites are engineered products which reduce the pressure on solid wood. This course deals with formulation of adhesives and manufacturing process of different biocomposites.

Course Contents		**CLOs**
Section A		
1	**Introduction:** Basic concepts, objectives and importance of composites and panel products in Bangladesh, basic wood elements, classification of wood composites, adhesives consideration	1, 2
2	**Plywood:** Manufacture and types of plywood, their uses, specifications and standards.	1, 2
3	**Laminated wood:** Definition; types of laminate, process of lamination, manufacture of laminated wood and Glulum, their uses; advantages and disadvantages.	1, 2
4	**Cement bonded board and binderless board:** definition, feature materials used, structural properties and uses.	1, 2
5	**Particleboard and fiberboard:** Definition, classification of particleboard and fiberboard, difference between particle board and fiberboard; manufacture process of particle board and fiberboard, their uses, specifications and standards. Density profile of particleboard and fiberboard	1, 2
Section B		**CLOs**
6	**Adhesion and adhesive:** Terminology: adhesive, adherend, adhesion; resin, glue; Theories of adhesion, Surface properties of wood; Physical properties of wood; Wetting; Setting of adhesives; Formulation of adhesives.	2, 3
7	**Adhesives for wood:** Introduction of adhesive in wood based industry; classification of adhesives; Synthetic adhesives: definition, types, working and strength properties of adhesives and their uses; wood adhesives for structural performance; Natural adhesives: definitions, types, formulation, properties and uses.	2, 3
8	**Adhesive bonding process:** Preparing wood for gluing; Gluing operation; Bonding process for various products; Testing and performance.	2, 3

9	**Wood finishes:** definition, types, objectives of finishes, criteria for selection of finishes, important finishes for wood; Paints: definition, purposes, components and drying, methods of paint application; Coating materials: definition, properties, advantages and disadvantages of common coatings.	2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Explain the basic manufacturing process of biocomposites and its properties testing	1, 2
	CLO2	Demonstrate the formulation process of adhesives.	1, 2, 9
	CLO3	Apply different adhesives in relevant processing industries.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO6	Lecture and Group Discussion	Viva voce and Final Exam.

Learning Materials

Recommended Readings

1. Bowyer J. L., Shmulsky, R. and Haygreen, J. G. (2007). *Forest products and wood science: an introduction* (5^{th} ed). Blackwell Publishing, USA
2. Brandt, A.M. (2009). *Cement based composites: materials, mechanical properties and performance*. Taylor & Francis Group.
3. Campbell, F.C. (2004). *Manufacturing processes for advanced composites.* Elsevier Advanced Technology, UK.
4. Ebnesajjad, S. (2008). *Adhesives Technology handbook* (2^{nd} edition). Willian Andrew, USA.
5. Forest Product Laboratory (2010). *Wood handbook: wood as an engineering material* (Centennial Edition). USDA Forest Service, Madison.

Supplementary Readings

6. Jones, D. (2007). *Review of existing bioresin and their application*. Building Research Establishment, UK.
7. Kollman, F.P., Kuenzi, E.W., and Stamm, A.J. (1978). *Principles of wood science and technology: wood based materials*, Vol. 2. Springer Verlag, Berlin.

8. Oliver, J.F. (1981). *Adhesion in cellulosic and wood based composites*. Plenum Press, New York.
9. Rowell, R. M. (2005). *Handbook of wood chemistry and wood composites*. CRC Press, USA.
10. Selbo, M. L. (1975). *Adhesive bonding of wood*. USDA Forest Service, Technical Bulletin 1512, Washington DC.

Course Code: 0821 05 FWT 3202	**Year:** Third	**Term:** Second
Course Title: Biocomposites and Adhesion Technology Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	The practical knowledge of adhesives formulation and processing biocomposites help students to understand alternative uses of solid wood.	

Course Contents		**CLOs**
Tasks		
1	Preparation of different types of glues, preparation of wood samples and application of glues and testing their bonding effectiveness;	1, 2, 3
2	Preparation of biocomposites and testing.	1, 2
3	Visit to different composite industries in Bangladesh.	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Perform the formulation of adhesives	1, 2
	CLO2	Perform the manufacturing and testing of biocomposites	1, 2, 9
	CLO3	Prepare different types of glues and adhesives	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture and Presentation	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Field visit to different forests and relevant organizations	Report Assessment and viva voce

Course Code: 0821 05 FWT 3203	**Year:** Third	**Term:** Second
Course Title: Forest Harvesting and Transportation Engineering		
Course Status: Core		
Credit: 2.0		
Prerequisite(s): None		
Rationale	Students are expected to learn the basics of cutting trees and transporting those logs into designated area or industry using economically sound methods and ensuring less damage to forest.	

Course Contents		CLOs
Section A		
1	**Introduction**: Definition and scope of Forest Harvesting. Harvesting techniques in Bangladesh forest.	1, 2
2	**Logging plans and costs**: Preparation of a logging plan; procedures of production and cost calculation of logging operation; production planning in logging; production standard; Reduced Impact Logging (RIL); sustainable forest management and RIL.	1, 2
3	**Felling operations:** Preparation and methods of felling; felling losses; equipment required for felling operation.	1, 2
4	**Conversion:** Procedure of delimbing, topping and bucking operations and equipment required in the operations.	1, 2
5	**Log Extraction:** Methods of log extraction-skidding and yarding; log landing-its location and characteristics; skid trail patterns; traditional, semi-mechanized and mechanized system of skidding; assortment, tree length and whole tree method of skidding, methods of cable yarding systems and their merits and demerits.	1, 2
6	**Log Transportation:** Types of land, water and aerial transportation of logs; traditional and mechanized systems of land and water transportation; types of loading and unloading of logs at landing and mill sites.	1, 2
7	**Maintenance:** Maintenance of felling, bucking, extraction and transportation equipment.	1, 2
8	**Log Storage and Depot:** Dry and wet storage of logs with their merits and demerits; types of depot; maintenance of depot records; stock taking at depot; methods of stacking; measures for protection of timber in depot.	1, 2
9	**Sale and Disposal:** Different systems of sale and disposal of forest produce; departmental versus private agency in harvesting of forest produce.	1, 2
10	**Safety and Ergonomics:** Safety requirements in logging operation; protective dress, ergonomic problem in harvesting activities.	1, 2
Section B		**CLOs**
11	**Introduction**: Difinition and necessity of Forest roads & their types.	3, 4
12	**Road Reconnaissance:** Obligatory points; alignment of plain and hill roads. Preliminary survey, location and demarcation.	3, 4
14	**Road Design:** Road and land width; gradients; earthwork; drainage etc.	3, 4
15	**Retaining walls and breast walls:** Materials used; Forces acting upon them; conditions of stability; rules of thumb for design of walls.	3, 4
16	**Culverts and Bridges:** Types of forest culverts and bridges; waterways selection for small culverts and bridges; principles of construction, economical spans; thumb rules in designing culverts and bridges.	3, 4

17	**Estimating principles:** Earthwork by trapezoid and prisomodial rules; cost estimates.	3, 4
18	**Construction:** Organization of labor; tools and equipment; grubbing; and cleaning; earth movement; road spicing.	3, 4
19	**Maintenance:** General wear of roads; surface maintenance; road signs.	3, 4
20	**Suspension bridge:** Types, specifications and principles of construction of common suspension bridges.	3, 4

	Upon completion of this course the students will be able to:		**Mapping with PLOs**
Course Learning Outcomes (CLOs)	CLO1	Identify a technically feasible logging method for a particular forest	1, 2
	CLO2	Formulate economically viable logging plan in a forest	1, 2, 9
	CLO3	Log transportation with minimum site/ecosystem damage	1, 2, 9
	CLO4	Design forest road, bridge and culverts with minimum cost and environmentally sound methods	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Sessions, J. (Ed.). (2007). *Forest road operations in the tropics*. Berlin, Heidelberg: Springer Berlin Heidelberg.
2. Brown, N. 1949. Logging. John Wiley and Sons, New York.
3. Castaneda, F. 1989. Logging and Transportation. UNDP/FAO Project BGD/85/011, Institute of Forestry Chittagong University, Chittagong.
4. Conway, 1982. Timber Cutting Practices, Miller Freeman Publishers, Inc. USA.
5. FAO/ILO. 1980. Chain Saws in Tropical Forests. FAO Training Series No. 2 FAO, Rome.
6. FAO 1985. Logging and Transportation in steep terrain. FAO Forestry paper No. 14. FAO, Rome.
7. FAO, 1977. Planning Forest Roads and Harvesting Systems. FAO Forestry Ppaer No. 2 FAO, Rome.

Course Code: 0821 05 FWT 3204	Year: Third	Term: Second
Course Title: Forest Harvesting and Transportation Engineering Sessional/ Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Students are expected to learn the basics of cutting trees and transporting those logs into designated area or industry using economically sound methods and ensuring less damage to forest.	

Course Contents		CLOs
Tasks		
1	Demonstration on use and maintenance of felling and bucking equipment.	1, 2, 3
2	Execution of felling, conversion and skidding operations and establishment of relationship between times required in each operation with quantity of converted materials.	1, 2
3	Preparation of a logging plan.	1, 2
4	Maintenance of log transportation equipment.	1, 2, 3
5	Field trips to forest to observe logging operation and transportation systems.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify a technically feasible and economically viable logging method for a particular forest	1, 2
	CLO2	Perform reduced impact logging (RIL)	1, 2, 9
	CLO3	Design forest road, bridge and culverts with minimum cost and environmentally sound methods	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 3205	Year: Third	Term: Second
Course Title: Social Forestry and Rural Development		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Social forestry program is an emerging and a widely practiced concept for rural development particularly in developing world given the continued	

	degradation of natural forest system. Thus, understanding the basic principles of how people can be brought into the main stream of forest management in developing nation in general and in Bangladesh in particular.

Course Contents		CLOs
Section A		
1	**Introduction**: Rationale and philosophy; essence of social forestry; concepts of social forestry; criteria for social forestry activities; characteristics of an ideal social forestry program; social forestry as a resource system; social forestry as a development strategy; social forestry vs. traditional forestry; types of social forestry.	1, 2
2	**Elements of Social Forestry**: Physical and socio-economic environment of social forestry; Targets of social forestry; goals and objectives of social forestry; delivery systems: transfer of technology, farmers fast, learning from experiences, participatory training; impacts of social forestry.	1, 2
3	**Social Forestry Planning**: Definition and concepts of plan and planning; characteristics of planning; importance of planning; objectives of planning; elements of planning; steps involved in planning; recognizing the advantages in planning; levels of planning; major types of plan/planning; social forestry planning process and cycle; conditions for better adoption of social forestry.	1, 2
4	**Social Forestry Practices in Bangladesh**: History and development trends of social forestry in Bangladesh; opportunities and constraints of social forestry development in Bangladesh; Social Forestry Rules of Bangladesh 2004.	3, 4
5	**Social Forestry Activities in Other Asian Countries**: India, Nepal, Thailand, The Philippines, Vietnam, Indonesia, People's Republic of China.	3, 4
Section B		**CLOs**
6	**Theories and Concepts of Rural development**: Theories, concepts, principles, goals, models and components of rural development; prerequisite for rural development; strategies of rural development.	3, 4
7	**Socio-economic Condition and Problems of Rural Areas of Bangladesh**: Economic, social, organizational, and physical conditions of rural areas in Bangladesh; problems related to rural areas of Bangladesh; rural social structures of Bangladesh; concepts of poverty; indicators of poverty; environment and poverty linkages in Bangladesh.	3, 4
8	**Rural Development Programs in Bangladesh**: Integrated Rural Development Programme (IRDP) in Bangladesh; role of Bangladesh Academy for Rural Development (BARD), Rural development Academy (RDA), food for works, and various NGOs in rural development of Bangladesh.	3, 4

9	**Local Government Institutions and Their Roles in Rural Development**: Definition and concepts of local Government in Bangladesh; structure of Bangladesh local government; history of local Government in Bangladesh in different regime; activities of different local government organizations in Bangladesh.	3, 4
10	**Roles of Social forestry in Rural development of Bangladesh**: Linkages of social forestry and rural development in Bangladesh	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand the concepts and issues related to social forestry and rural development in Bangladesh.	2, 4
	CLO2	Know about the various programs and practices related to social forestry and rural development in Bangladesh and in other Asian countries	4, 5, 9
	CLO3	Understand the impact of social forestry and rural development programs and practices to improve the rural livelihood and conservation of natural forests in Bangladesh	5, 6, 9
	CLO4	Choose appropriate tools and approaches of social forestry in management and conservation of forest resources in Bangladesh.	5, 6, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. S.K. Ghosh & Rita Singh 2016. Social Forestry and Forest Management. Global Vision Publishing House ISBN-10 : 8187746351, ISBN-13 : 978-8187746355
2. MP Digya 2008. Social Forestry & Agroforestry Satish Serial Publishing House ISBN-13 978-8189304485
3. Sushil Kumar 2000. Social Forestry Reliance Publishing House, 234 pages
4. M. S. Rao 1987. Introduction to Social Forestry. Oxford & IBH Publishing Company, 87 pages
5. Ahmed, M.R. 1991. Social Forestry: Theories, concepts and Applications. Paper prcscnted at the Scminar on " Management of Social Forestry Projects" held on Feb. 17-20, 1991. In Dhaka Organized by World Food Programme.

Supplementary Readings

6. FAO, 1985. Tree growing by the rural people. FAO Forestry Paper No. 64, FAO, Rome.
7. FAO, 1985. Monitoring and evaluation of participatory forestry projects. FAO Forestry Paper No. 60, FAO, Rome.
8. FAO, 1982. Village Forestry Development in the Republic of Korea: A case study. FAO, Rome.
9. Mango, V. C. 1986. Community Forestry Handbook. FAO/UNDP Project BFD/81/028. Field Document No. 1 Ministry of Agriculture, Forest Department, Bangladesh & FAO, Rome.
10. Rao, Y. S. *et al*. 1986. Community Forestry: Socio- economic aspects. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand.
11. Rebugio, L.L. (ed) 1990. Readings on Rural Development, Social Forestry and Forestry Extension Vol. 3 (social Forestry). UNDP/FAO Project BGD/85/011, Field Document No. 23. IFCU & FAO, Rome 291 pp.

Course Code: 0821 05 FWT 3206	**Year: Third**	**Term: Second**
Course Title: Social Forestry and Rural Development Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		

Rationale	While natural forest systems almost lost their resilience to support forest resources supply, social forestry is on wider participation of local people playing vital role in the protection and regeneration of forest resources on marginal lands is very important mechanism of rural development in Bangladesh.

Course Contents		**CLOs**
Tasks		
1	The course includes orientation tours to different social forest areas and rural development organizations (both GOs and NGOs) in Bangladesh to collect information of the programs.	1, 2
2	A brief presentation on the social forestry activities organized by the local forest officials at their office to introduce the students	1, 2
3	Students will be visiting different social forestry models/practices in the adjoining areas with the help of the forest officials.	1, 2
4	Students will be interviewing various participants/target people of the respective program using FGD	1, 2
5	Students will be taken to various rural development institutions such as BARD Comilla, RDA Bogra, BRDB, various NGOs and INGOs etc. to visit their ongoing rural development activities.	1, 2
6	Students will be assessing the operational structure of various rural development activities conducting by the Local Government Organizations such Union Council, Sub-district Administration, District Administration etc.	1, 2

7	Students will interview the people to know the rural social structure of the visited areas	1, 2
8	A discussion session will be arranged at the end of each task among the students to recap the task	1, 2
9	Students will be assessing the overall status, performance, and prospects of the various social forestry and rural development activities visited	1, 2
10	Students will prepare and submit final tour report individually/in group at the end of every tour	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Unite land-tree-people together to maximize land productivity, ecological sustainability, and social equity	2, 4
	CLO2	Identify and develop social forestry models suitable for forest expansion and poverty reduction in rural Bangladesh	5, 6, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce

Course Code: 0111 05 FWT 3207	**Year: Third**	**Term: Second**
Course Title: Research Methodology		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Research is an integral part of forestry undergraduate program, hence a comprehensive knowledge on research method is required to conduct a thesis in pursuit of achieving B.Sc. (Hons.) in Forestry.	

Course Contents		**CLOs**
Section A		
1	**Research:** Definition, characteristics, types, purpose and importance	1, 2, 6
2	**Nature and process of research:** Research strategies, Research designs, Planning a research project and formulating research questions, Reviewing the literature, Ethics and politics in research, Structured observation, Content analysis, Mixed methods research: combining quantitative and qualitative research.	1, 2, 6
3	**Research problem:** Definition, identification and source of research problem, criteria for an appropriate research problem, problems common to forestry research.	1, 2, 6

4	**Research proposal:** Techniques of preparing a research proposal.	1, 2, 6
5	**Style and format of report writing:** Types of reports, steps in report writing, format of the research report, style and typing of research report; proof reading of the final research report, problems of preparing research report.	1, 2, 6
6	**Sampling:** Types of sampling, their advantages & disadvantages and applications; sample size, sampling error, non-sampling error.	1, 2, 6
Section B		**CLOs**
7	**Experimental design:** Concept and types of experimental design, their applications, advantages and disadvantages, analysis of variance (ANOVA) for completely randomized, randomized block and latin square, factorial and split plot designs, multiple comparison test (LSD, DMRT, Tukey, SNK).	3, 4,5
8	**Practical matters of experimentation**: Choice of site, size and shape of research plots; marking out the plan; methods of randomizing, the application of treatments, sampling in field experiment.	3, 4,5
9	**Statistical data:** Type of data; collection, processing, presentation, and transformation of data.	3, 4,5
10	**Test statistics:** Concept of hypothesis, steps in testing hypothesis, the form (mathematical expression) of testing statistical hypothesis, t- test, chi-square test, variance analysis, correction and regression.	3, 4,5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Find out a research problem and conduct independent research.	6, 7
	CLO2	Chose right kind of research method for specific research problem	6, 7
	CLO3	Collect, summarize and present data using statistical tools	3
	CLO4	Interpret and predict statistical model by the application of different significance test	7, 8, 9
	CLO5	Perform laying out field plan and compute analysis of variance under different experimental designs	7, 8, 9
	CLO6	Write a research proposal and scientific report.	7, 8, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO6	Lecture and Group Discussion	Viva voce and Final Exam.

Learning Materials

Recommended Readings

1. Zar, J. H. (2010). *Biostatistical analysis: books a la carte edition*. Prentice Hall.
2. Gomez, K. A., & Gomez, A. A. (1984). Statistical procedures for agricultural research. John Wiley & Sons.
3. Jayaraman, K. (2000). A statistical manual for forestry research (pp. 1-231). FORSPA. FAO, Bangkok.
4. Rice, J. A. (2006). Mathematical statistics and data analysis. Cengage Learning.
5. Crawley, M. J. (2012). The R book. John Wiley & Sons.

Supplementary Readings

6. Bailey, N.T.S. 1994. Statistical Methods in biology. Cambridge University Press.
7. Frank, H, and Althoen, S.C. 1994. Statistics: Concepts and applications. Cambridge University Press, 853 pp.
8. Gupta, S. 1993. Research methodology and statistical Techniques. Deep & Deep Publications, New Delhi, 510 pp.
9. Mian, M.A. and Miyan, M.A. 1984. An introduction to statistics. Ideal Livrary, Dhaka, 915 pp.
10. Temu, A.B. 1990. Forestry Research Methodology. UNDP/FAO Project BGD/85/011. Field Document No. 11, IFCU & FAO Rome, 40 pp.

Course Code: 0111 05 FWT 3208	**Year: Third**	**Term: Second**
Course Title: Research Methodology Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Students of this course are expected to have practical knowledge on research method and process to conduct an independent research in future.	

Course Contents		**CLOs**
Tasks		
1	Exercises in review of literature.	1, 2, 3
2	Structured interviewing, Self-completion questionnaires, Asking questions, Structured observation	1, 2, 3

3	Documents as sources of data, Qualitative data analysis, Computer-assisted quantitative data and qualitative data analysis: using software, e.g. Excel, SPSS, R.	1, 2, 3
4	Field exercises on lay out experiments, collection, summarization and analysis of data.	1, 2, 3
5	Practical work in the laboratory for t-tests, chi-square tests, regression analysis and analysis of variance (ANOVA) under different experimental designs using Microsoft Excel and statistical software operation.	1, 2, 3
6	Exercises in report writing specially referencing using citation manager software.	4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Know how to collect and summarize and present data practically	3, 6
	CLO2	Layout field plan, perform significance test, predict best model by regression analysis and compute analysis of variance to find out best treatment factor	6, 7, 9
	CLO3	Analyze both quantitative and qualitative data.	3, 8, 9
	CLO4	Write a research proposal and a scientific paper	6, 7

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 3209	**Year: Third**	**Term: Second**
Course Title: Wildlife Management and Nature-Based Tourism		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Wildlife is one of the key components of forest ecosystem. Forests provide habitats for wildlife. The fundamental knowledge of wildlife particularly principles of wildlife management, biology, ecology, and conservation are important for forest management. Nowadays, controlled nature-based tourism plays an important role in serving recreational facilities and sustainable forest management. Therefore, this course has been designed for the students to acquire the fundamental knowledge on wildlife and nature-based tourism.	

Course Contents		CLOs
Section A		
1	**Classification and morphology of important wildlife of Bangladesh up to families particularly the following classes**: (i) Amphibia; (ii) Reptilia; (iii) Aves and passerine birds; (iv) Mammalia.	1, 2
2	**Status and distribution of important wildlife of Bangladesh**: Frogs, crocodiles, turtles, snakes, birds, tiger, deer, monkey, dolphins.	1, 2
3	**Wildlife population, their habitat and adaptation and their breeding biology**: Census/counting, density, age and sex ratio, natality and mortality, populations of reptiles, birds and mammals; terrestrial and aquatic habitats of reptiles, birds and mammals; their rearing cycle, food and feeding habits of these wildlife.	1, 2
4	**Conservation status of wildlife**: Endangered, threatened and rare wildlife of Bangladesh and their causes of decline, principles and roles of wildlife conservation, conservation and management of wildlife, conservation of ecosystem and threatened species; Status and strategies for wildlife management in Bangladesh; Wildlife-Human conflict: definition of wildlife-human conflicts, causes of wildlife-human conflicts, solutions of wildlife-human conflicts.	1, 2
Section B		**CLOs**
5	**Nature-based tourism:** Definitions and concepts of leisure, recreation, play, and tourism; concept of nature-based tourism (NBT), historical development of nature-based tourism, types and forms of NBT, components of NBT, impacts and characteristics of NBT.	3, 4
6	**Sustainable nature-based tourism:** Concepts of sustainability and sustainable development, SDGs and NBT, global and national perspectives of sustainable NBT, criteria and indicators of NBT, actors involved in NBT, key challenges of sustainable NBT.	3, 4
7	**Wildlife and tourism policies and legislations in Bangladesh:** Legislations (all up to date acts and rules) and administration on wildlife management and sustainable nature-based tourism.	3, 4
8	**Protected areas:** History of protected areas in the world and Bangladesh, IUCN categories of protected areas, importance of protected areas for wildlife habitat and nature-based tourism, status of protected areas.	3, 4
9	**Protected area (park) management techniques:** Planning and design, administration and management, facility improvement and development, management capacity, buffer zone, protection and problems. Conservation and management of wildlife, history of national parks, wildlife sanctuary and game reserves; Bangladesh Wildlife Advisory Board.	3, 4
10	**International organizations:** WWF, CITES, IPPL, ISSC, ICBP, WCPA, UNEP, etc.	3, 4

	Upon completion of this course the students will be able to:		Mapping with PLOs
Course Learning Outcomes (CLOs)	CLO1	Familiarize with the important wildlife and their habitats of Bangladesh.	1
	CLO2	Describe the biology, ecology, management and conservation of wildlife of Bangladesh.	1
	CLO3	Perform protected area management.	4, 5, 6, 7, 9
	CLO4	Adapt appropriate strategies for sustainable nature-based tourism.	4, 5, 7, 8, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Alcock, J. (2022). Animal Behaviour: An Evolutionary Approach (10th Edition). Link (free access: 7th edition): https://media.oiipdf.com/pdf/78b7ae60-01db-4372-ae12-c801a466bd0e.pdf
2. Fryxell, J. M., Sinclair, A. R. E. and Caughley, G. (2014). Wildlife Ecology, Conservation, and Management (3rd Edition). Wiley Blackwell. (2nd edition has free access to download).
3. Miller, G. T. Jr. and Spoolman, S. E. (2009). Essentials of Ecology (7th edition). Brooks/Cole, Cengage Learning. Link (free access: 5th edition): https://silo.pub/essentials-of-ecology-fifth-edition.html
4. Khan, M. A. R. (2015). Wildlife of Bangladesh Checklist and Guide (2nd edition). NHBS Ltd. ISBN: 9789849028284.
5. Khan, M. M. H. (2018). Photographic Guide to the Wildlife of Bangladesh. Arannayk Foundation: Dhaka. The University Press Limited.

Supplementary Readings

6. Rahman, A. N. M. A. (2015). Wildlife of Bangladesh. ISBN: 9789843397706. Department of Films and Publications, Ministry of Information, Government of the People's Republic of Bangladesh.
7. A-Z Animals. Animals in Bangladesh. Link: https://a-z-animals.com/animals/location/asia/bangladesh/
8. CBD, UNWTO, & UNEP. (2009). Tourism for nature & development: A good practice guide. Montreal.
9. Miller, G., & Twining-Ward, L. (2005). Monitoring for a sustainable tourism transition: The challenge of developing and using indicators: Cabi.

10. Harris, R., Williams, P., & Griffin, T. (2012). Sustainable tourism: Routledge.
11. Jones, T. E., Bui, H. T. and Apollo, M. (eds) (2021). Nature-Based Tourism in Asia's Mountainous Protected Areas: A Trans-regional Review of Peaks and Parks. Springer Nature.

Course Code: 0821 05 FWT 3210		**Year: Third**	**Term: Second**
Course Title: Wildlife Management and Nature Based Tourism Sessional/Fieldwork			
Course Status: Core			
Credit: 1.0			
Prerequisite(s): None			
Rationale	A laboratory of this course is designed to familiarize students with the characteristics, life history traits and identification of common birds, mammals, reptiles and amphibians of Bangladesh.		

Course Contents		**CLOs**
Tasks		
1	Study of museum specimens of common birds, mammals, reptiles and amphibians of Bangladesh.	1, 2, 3
2	Visit habitats of some important wildlife of Bangladesh.	1, 2
3	Visit different nature parks and forest	1, 2
4	Perform the survey wild life abundance and wild life conflict survey	1, 2, 3
5	Report writing	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify different common birds, mammals, reptiles and amphibians of Bangladesh with their characteristics and life history traits	1, 5
	CLO2	Determine wildlife abundance	6, 9
	CLO3	Set appropriate strategies for park and nature-based tourism management	7, 8, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0720 05 FWT 3211*		Year: Third	Term: Second
Course Title: Rubber and Tea Science			
Course Status: Optional			
Credit: 2.0			
Prerequisite(s): None			
Rationale	This course is designed for third year students of Forestry and Wood technology discipline. This course tends to focus on tea and rubber cultivation, management and marketing of tea and rubber products.		

Course Contents		**CLOs**
Section A		
1	**Introduction:** History of tea cultivation and its importance to national economy of Bangladesh; tea plant- botanical description of tea agro-types in Bangladesh; characteristics and management of shade trees and ancillary crops, green manuring and cover crops	1, 2
2	**Tea Ecosystem:** Climatic and edaphic factors suitable for tea culture	1, 2
3	**Agro-techniques of Tea Culture:** Nursery management- propagation by seed and vegetative parts, techniques for selection of mother bush from seedbarie and nucleus clonal plot; techniques of nursery bed preparation for seeds and vegetative parts; nursery, planting techniques and maintenance of nursery plants.	2, 3
4	**Tea Crop management and protection:** Planting techniques-land preparation, planting techniques for tea, shade trees and green crops; bringing up young tea to maturity; pruning, plucking and manuring, fertilization; maintenance of mature tea; pest control strategies.	2, 3
5	**Tea Manufacture process:** Plucking-techniques, leaf handling, withering, processing, fermentation, drying, sorting and grading process; Tea beverage and grades	2, 3
Section B		**CLOs**
6	**Introduction:** History and development of rubber cultivation and its importance in the economy of Bangladesh.	3, 4
7	**Rubber Ecosystem:** Climatic and Soil requirement, Site selection and preparation of land	3, 4
8	**Rubber plant propagation:** propagation from seeds: seed collection, germination; clonal propagation: Bud bank, bud grafting, ramets maintenance; important clones of rubber, planting techniques and maintenance of rubber plantation.	4, 5
9	**Rubber crop management:** Pests and diseases control strategies.	4, 5
10	**Latex harvesting:** Techniques and rules of tapping; collection and processing of latex leading to crude rubber production; grades and final products	4, 5

		Upon completion of this course the students will be able to:	**Mapping with PLOs**
Course Learning Outcomes (CLOs)	CLO1	Describe common terms and techniques used in establishing and influencing composition, growth, and quality of rubber and tea plantations.	1, 2
	CLO2	Apply principles of raising nursery through appropriate species selection, manage nursery related activities and establish rubber and tea plantation.	1, 2, 9
	CLO3	Apply of commonly used intermediate treatments, including commercial and pre-commercial thinning, pruning, fertilization, and vegetation management.	1, 2, 9
	CLO4	Control of plant pest and diseases into developing economically and environmentally sustainable practices.	1, 2, 9
	CLO5	Apply the best strategies to collect high quality produces from the plants and further processing to provide best quality rubber and tea products.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Sana, D. L. 1989. Tea Science. Asharfia Boi Ghar, 36 Bangla Bazar, Dhaka 1000. 172 pp.
2. Sana, D.L. (1990): Chaer Kitdamon Nirdeshika.
3. Edgar, A.T. 1960. Manual of rubber planting. Malaya, Khala Lumpur, Incorp. Soc. of planters.
4. Eden, T. 1965. Tea. 2nd Ed. Longman's Green. London.
5. Khisa, S.K.1991. Parbbyattya Chattagramme Heaved Rubber Chash-o-prokriajatkaran (Bengali Version), Unnayan Board Residential Area, Khagrachari.
6. Rao, B.S. 1975. Maladies of Hevea in Malaysia. Rubber Research Institute of Malaysia, Kuala Lumpur, 108 pp.

Course Code: 0720 05 FWT 3212*		Year: Third	Term: Second
Course Title: Rubber and Tea Science Sessional / Fieldwork			
Course Status: Optional			
Credit: 1.0			
Prerequisite(s): None			
Rationale	This course tends to center on practical knowledge on rubber and tea science to know the components of the ecosystem, harvesting and marketing of products.		

Course Contents		CLOs
Tasks		
1	Visit to tea estate to observe tea ecosystem, plucking techniques, and manufacturing process.	1, 2, 3
2	Visit rubber plantation to observe rubber ecosystem, tapping techniques, and processing.	1, 2, 4
3	Preparation of oral, poster, power point presentation and group discussion	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		Mapping with PLOs
	CLO1	Understand the propagation and plantation technique of tea crops	1, 2
	CLO2	Describe tea processing techniques	1, 2, 9
	CLO3	Explain tea manufacturing and grading	1, 2, 9
	CLO4	Understand rubber plantation techniques, tapping techniques and latex processing	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0731 05 FWT 3252*		Year: Third	Term: Second
Course Title: Geographic Information System Sessional			
Course Status: Optional			
Credit: 2.0			
Prerequisite(s): None			
Rationale	This course provides understanding of different ArcGIS software to prepare map with database and analyze the map that helps the student of forestry to create their forest map for planning and decision making in forest management		

Course Contents		CLOs
Tasks		
1	Concept of Different GIS software and their capabilities to analyze forestry related issues.	1, 2, 3
2	Introduction to ArcGIS/Arc-Catalog/ ArcMap: Coordinate system and projection, Digitizing & editing.	1, 2
3	Database development: Attribute table	3
4	Data analysis: Extract, Overlay and Proximity etc.	4
5	Conversion of Layer to KML and KML to Layer and projection of KML on Google Earth	5
6	Data and digital map presentation using- ArcMap	6

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Digitize a raster image into vector image	1, 2, 3
	CLO2	Make projection of map in different coordinate system	1, 2, 9
	CLO3	Crate attribute table	1, 2, 9
	CLO4	Analyze the map through analysis tools	3, 9
	CLO5	Convert Layer to KML and KML to Layer to integrate Google Earth and GIS	3, 9
	CLO6	Prepare and present map	3, 6, 7, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Lecture and Presentation	Report Assessment and viva voce
CLO5	Lecture and Presentation	Report Assessment and viva voce
CLO6	Lecture and Presentation	Report Assessment and viva voce

Fourth Year First Term

Course Code: 0821 05 FWT 4101	**Year:** Fourth	**Term:** First
Course Title: Agroforestry and Farming System		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Students of this course are expected to understand and learn the rationale and basics of integrated land use compared to monoculture agriculture and monoculture forestry.	

Course Contents		**CLOs**
Section A		
1	**Introduction and concepts:** Definition, Nature, attributes and the productive and protective role of Agroforestry. History of Agroforestry development, Advantages and constraints of Agroforestry.	1, 2
2	**Classification of Agroforestry:** Different basis for classification of Agroforestry, Agroforestry production systems.	1, 2
3	**Principles of species selection for Agroforestry practices:** Principles and criteria of species selection for different combinations. Concept of Multipurpose tree species,	1, 2
4	**Tree domestication:** Concept, principles, process and applications of tree domestication.	1, 2
5	**Agroforestry planning:** Biophysical and socio-economic surveys by diagnosis and design method; evaluation of species adaptability for agroforestry system.	1, 2
6	**Agroforestry Management:** Tree management, agricultural management, evaluation of trees and shrubs for agroforestry system.	1, 2
7	**Financial and economic Analysis of Agroforestry projects:** Identification of project; Aspects of project preparation and formulation, Costs and benefit analysis, demonstration of agroforestry farms.	1, 2
Section B		**CLOs**
8	**Important agroforestry practices in different Agro-ecological zones of Bangladesh:** Description, types, advantages and constraints of different practice in different Agro-ecological regions of Bangladesh, Appropriateness of those practices.	3, 4
9	**Agroforestry in other Sub-tropical and Tropical countries:** Description, features, characteristics and importance of different agroforestry practices in some Tropical and Sub-tropical countries.	3, 4
10	**Home-garden:** Characteristics, diversity, importance and management.	3, 4

11	**Concept, characteristics and components of farming system:** physical, biological and economical determinants of farming systems. Farming system development, Farming system research and development.	3, 4
12	Agroforestry in farming systems in Bangladesh.	3, 4
13	**Farming systems in Bangladesh:** Characteristics subsistent and commercial and specialized and mixed; improvement of the existing farming systems; present status of crop diversification in Bangladesh.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Perceive and explain the concepts and advantages of agroforestry.	1, 2
	CLO2	Identify and design suitable agroforestry practice and technology for specific land use.	1, 2, 9
	CLO3	Understand how to manage agroforestry as a sustainable land use system.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Tropical Agroforestry - Alain Atangana, Damase Khasa, Scott Chang & Ann Degrande- Springer Publications 2014. https://doi.org/10.1007/978-94-007-7723-1
2. RECOFTC, ICRAF and AWG-SF. 2020. Agroforestry for climate-resilient landscapes, Bangkok, RECOFTC.
3. The silvicultural basis for agroforestry systems. Edited by Mark S. Ashton, Ph.D, M.F. Florencia Montagnini, Ph.D., M.S. CRC Press, Boca Raton London New York Washington.
4. Gurung, T.R. and Temphel, K.J., (Eds). 2015. Technological advancement in agroforestry systems: Strategy for climate smart agricultural technologies in SAARC Region.
5. Chaturvedi, O.P., Handa, A.K., Uthappa, A.R., Sridhar, K.B., Kumar, Naresh, Chavan, S.B. and Rizvi, Javed. 2017. Promising Agroforestry Tree Species in India. Jointly published by the Central Agroforestry Research Institute (CAFRI), Jhansi, and the South Asia Regional Programme (based in Delhi, India) of the World Agroforestry Centre.

Supplementary Readings

6. Handbook for Agroforestry Planning & Design: The Center for Agroforestry University of Missouri - Michael Gold, Mihaela Cernusca & Michelle Hall, Eds.
7. Agroforestry: Classification and Management – edited by Kenneth G. MacDicken and Napoleon T. Vergara,1990.

8. Sullivan, Gregory M., Susan M. Hoke, and Jefferson M. Fox (Eds). 1992. Financial and Economic Analyses of Agroforestry Systems. Proceedings of a workshop held in Honolulu. Hawaii. USA. July 1991. Paia: Nitrogen Fixing Tree Association.
9. Martini E, Nguyen HT, Mercado Jr AR, Finlayson RF, Nguyen TQ, Catacutan DC, Triraganon R. 2020. Practitioner's field guide: agroforestry for climate resilience. Bogor, Indonesia: World Agroforestry (ICRAF); Bangkok, Thailand: RECOFTC.
10. Agroforestry for Soil Management - by Anthony Young. CAB International, 1997.

Course Code: 0821 05 FWT 4102	**Year: Fourth**	**Term: First**
Course Title: Agroforestry and Farming System Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Students of this course are expected to see and examine in reality the prospects, usefulness and management of agroforestry.	

Course Contents		**CLOs**
Tasks		
1	Visit to NGOs and FDs agroforestry practices including forestland agroforestry in different region of Bangladesh	1, 2, 3
2	Practice of D&D approach in the field for assessment and design of appropriate agroforestry practices and technologies	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Recognize different production systems and identify different components.	1, 2
	CLO2	Realize the complexity and prospects of integrated land use.	1, 2, 9
	CLO3	Diagnose and design appropriate practices.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 4103	**Year:** Fourth	**Term:** First
Course Title: Forest Management		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	Forest management course is designed to accumulate the knowledge for different subject of forestry undergraduate program to operationalize a management regime for a certain forest.

Course Contents		**CLOs**
Section A		
1	**Forest as a resource:** Classification of resources; forest as a renewable resource; characteristics of forest resources; definition and scope of forest management, principles of forest management.	1, 2
2	**Objects of management:** Forest policy and forest management linkage, forest management objectives in respect of ecological, economic and social demand.	1, 2
3	**Participatory forest management:** Co-management of forests, joint forest management, community forestry; REDD+; CDM.	2, 3
4	**Rotation or the production period:** Definition and kinds of rotations for forest crops; factors affecting choice of rotation.	2, 3
5	**Forest investment planning:** Concept of NPV, IRR, LEV, forestry business plan, Forest Management Plan and Working Plan.	2, 3
6	**Forest conflicts and conflict management:** Conflict escalation, conflict resolution, conflict management.	2, 3
7	**Forest restoration:** Forest restoration through ecosystem restoration. Forest restoration planning, forest vegetation mapping and site-specific planning.	2, 3
8	**Forest management in Bangladesh:** Organization of forests, primary territorial units, silvicultural units, administrative organizations, and silvicultural treatments.	2, 3
Section B		**CLOs**
9	**Normal forest:** Definition and concept of normal forest; the need for an ideal standard for monitoring; effect of silvicultural systems on normality; the normal even-aged forest; the normal uneven aged forest; volumes, values, and types of normal forests.	4, 5
10	**Determination of growing stock and increment:** General considerations and the need for repeated inventories; distribution of age gradations of classes in regular forests; normal and actual distribution of age classes in forests under various silvicultural systems; growth estimation and reduction factors for density, quality, etc. Volumes and increment of stands; factors affecting quality and price increment; choice of final felling time.	4, 5
11	**Yield regulation and yield planning:** Yield regulation and silviculture; regulating the yield of services. Yield regulation in regular forests: Yield regulation and silviculture; regulating the yield of services. Yield regulation in Irregular forests: Yield based on growing stock only; yield based on increment only; yield based on growing stock and increment.	4, 5

12	**Stumpage appraisal methods:** Various stumpage methods; stumpage appraisal in Bangladesh.	5, 6
13	**Sustained yield:** Sustained yield concept; progressively increasing levels of yield on a sustained basis; definition and explanation of related terms-felling series, rotation, felling cycle, cutting series.	5, 6
14	**Existing management and resource inventory units:** Resource Information Management System (RIMS) and Geographic Information System (GIS) in the forestry sector of Bangladesh. Management of BFIDC & BCIC; (critical reviews of the actual functioning of the BFIDC & BCIC).	5, 6

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Formulate the different strategies of forest management.	1, 2
	CLO2	Explain the concept of Sustained Yield, Rotation, Normal Forest, Growing stock and Increment.	1, 2, 9
	CLO3	Perform the yield regulation, yield planning and stumpage appraisal	1, 2, 9
	CLO4	Describe the present and past forest management regime of Bangladesh.	1, 2, 9
	CLO5	Understand the concept of co-management and forest resource management plan.	1, 2, 9
	CLO6	Understand forest and ecosystem restoration.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO5	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO6	Lecture and Group Discussion	Viva voce and Final Exam.

Learning Materials

Recommended Readings

1. Pant, M. M. (1998). Forest Management. Institute of Forestry, Chittagong University, Chittagong, Bangladesh.
2. Davis, L. S. (2001). Forest Management: To Sustain Ecological, Economic, and Social Values (latest edition)

3. Franklin, J. F., Johnson, K. N., & Johnson, D. L. (2018). Ecological forest management. Waveland Press.
4. Butler, W. H. (2019). A New Era for Collaborative Forest Management. A New Era for Collaborative Forest Management
5. Colfer, C. (2010). The complex forest: communities, uncertainty, and adaptive collaborative management. Routledge.

Course Code: 0821 05 FWT 4105*	**Year:** Fourth	**Term:** First
Course Title: Forest Development Planning and Project Designing		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		

Rationale	The study of forest development planning is important to ensure sustainable management of forest resources along with the protection of areas identified as significant for conservation where effective stakeholder participation in the planning process is considered. Formulation of new projects is very common in forestry practices. Therefore, project designing part of this course has been planned to strengthen students' knowledge and skills in designing and writing project proposals.

Course Contents		**CLOs**
Section A		
1	**Introduction** to development, purpose, various aspects of development, SDGs; plan and planning, their types; introduction to forest development planning, its objectives, characteristics and importance; economic growth and economic development, challenges and weaknesses of development projects.	1, 2
2	**Principles of development planning**: Realism and flexibility in planning; environmental, social, financial and political considerations in forest development planning process.	1, 2
3	**Status of economic development in Bangladesh**, meaning of sector and sector analysis emphasizing forestry sector, forestry sector and national economy, forecasting demand and supply of forest resources, challenges of forestry sector in Bangladesh.	1, 2
4	**Social coast and benefits**; financial analysis: discounting and compounding, NPV, Benefit-cost ratio, IRR, Pay Back Period (PBP).	1, 2
Section B		**CLOs**
5	**Theory of change**, concept of program and project, research project and development project, introduction to design, monitoring and evaluation (DME) cycle.	3, 4
6	**Structure of research and development project** including logical framework, time frame and capital budgeting.	3, 4

7	**Project appraisal**: Structure of project appraisal, risk and uncertainty, ranking of projects.	3, 4
8	**Monitoring**, evaluation and learning of a project.	3, 4
9	**Role of Forest Department and NGOs** in forestry development in Bangladesh.	3, 4
10	**Major development projects** implemented for the forestry sector development in Bangladesh.	

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Demonstrate the principles of development planning process.	1, 2
	CLO2	Perform the financial evaluation of a development project.	1, 2, 9
	CLO3	Design and look after a project.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Bettinger, P., Boston, K., Siry, J., Grebner, D., Bettinger, P., Boston, K. Siry, J. Grebner, D. (2008). Forest Management and Planning. Elsevier.
2. Caldwell, R. (2002). Project Design Handbook. Care. TANGO International, Arizona. Link (free access): https://www.fsnnetwork.org/sites/default/files/dme_-_cares_project_design_handbook.pdf
3. European Commission (2001). Manual project cycle management. Free access available.
4. Gawler, M. (2005). Project Design in the context of Project Cycle Management Sourcebook. WWF (free access available).
5. ILO (2010). Project Design Manual: A Step-by-Step Tool to Support the Development of Cooperatives and Other Forms of Self-Help Organization. Link (free access): https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---coop/documents/instructionalmaterial/wcms_159819.pdf
6. Udenka, A. (2012). Practical Development Project Design, Planning and Execution. SSRN Electronic Journal. Link (free access): https://www.researchgate.net/publication/256050646_Practical_Development_Project_Design_Planning_and_Execution
7. USDA (2008). Preparing a Forest Plan: Foundations of Forest Planning (volume 1, version 3.1). https://www.fs.fed.us/emc/nfma/includes/Vol1Ver3_Preparing_a_FP_10102008.pdf

Course Code: 0821 05 FWT 4106*		Year: Fourth	Term: First
Course Title: Forest Development Planning and Project Designing Sessional/Fieldwork			
Course Status: Optional			
Credit: 1.0			
Prerequisite(s): None			
Rationale	The course is designed for fourth year first term students of Forestry and Wood Technology Discipline of Khulna University. Students are expected to prepare a development project and contribute to forestry sector development after graduation.		

Course Contents		**CLOs**
Tasks		
1	Demonstration of development project preparation. Developing a logical framework for forestry sector analysis in Bangladesh.	1, 2, 3
2	Visit to Government .and NGO's Forestry development projects in different areas of Bangladesh.	1, 2
3	Writing and submitting of report(s).	1, 2

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Prepare a development project proposal.	6, 7
	CLO2	Develop a logical framework for forestry sector analysis.	6, 7, 9
	CLO3	Design project monitoring and evaluation strategies	7, 8, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 4107		Year: Fourth	Term: First
Course Title: Pulp and Paper Technology			
Course Status: Core			
Credit: 3.0			
Prerequisite(s): None			
Rationale	Pulp and paper Technology is an important branch of wood science which deals with production of pulp and paper from wood and other lignocellulosic materials.		

Course Contents		CLOs
Section A		
1	**Cell wall components**: Physical, chemical and morphological properties of cellulose; hemicelluloses and lignin.	1, 2
2	**Preparation of pulpwood:** Raw materials, types, properties, and processing.	1, 2
3	**Pulping methods:** Chemical pulping, mechanical pulping and biological pulping; chemical recovery.	1, 2
4	**Bleaching:** Bleaching chemicals, sequence and chemistry.	1, 2
5	**Pulp characterization:** Physical, chemical and mechanical properties.	1, 2
6	**Recycle fibers:** Preparation and recovery.	1, 2
Section B		**CLOs**
7	**Beating and refining:** Methods, functions and applications.	3, 4
8	**Stock preparation and additives for paper making:** Types of additives, functions, wet end chemistry, addition of nano-particles.	3, 4
9	**Paper manufacturing:** Paper machine, chemistry, pressing, dry end operations, drying coating and sizing.	3, 4
10	**Grading:** Different grades of paper and paper board; tissue papers.	3, 4
11	**Testing:** Physical and mechanical properties of paper.	3, 4
12	**Pulp, and paper industry**: Status, problems and prospects of in Bangladesh; Environmental aspects: types of pollution and mitigation.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand the properties of important cell wall components.	1, 2
	CLO2	Understand the different types of pulping and bleaching methods.	1, 2, 9
	CLO3	Understand the different paper making technologies.	1, 2, 9
	CLO4	Test the properties of pulp and paper.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Bajpai, P. (2010). *Environmentally friendly production of pulp and paper*. John Wiley & Sons.
2. Bajpai, P. (2013). *Biorefinery in the pulp and paper industry*. Academic Press.
3. Britt, K.W. (1984). *Handbook of pulp and paper technology*. CBS Publisher's & Distributors.
4. Hillis, W. E. (1962). *Wood extractives and their significance to the pulp and paper industries*. Elsevier Inc.
5. Ilvessalo-Pfäffli M. (1995). *Fiber atlas: identification of papermaking fibers*. Springer-Verlag, Berlin.

Supplementary Readings

6. Särkkä, T., Gutiérrez-Poch, M. and Kuhlberg, M. (2018). *Technological transformation in the global pulp and paper industry 1800–2018: comparative perspectives*. Springer International Publishing.
7. Smook, G.A. (2016). *Handbook for pulp and paper technologists* (4th edition). Tappi Press.
8. Suess, H. U. (2010). *Pulp bleaching today (green sciences)*. De Gruyter, Berlin.
9. Troup, R. S. (1970). *Indian Forest Utilization*, Vol 1. Forest Research Institute, India.

Course Code: 0821 05 FWT 4108	**Year:** Fourth	**Term:** First
Course Title: Pulp and Paper Technology Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	The practical knowledge of pulp and paper technology enables to produce pulp and different grades of paper and identifying their properties.	

Course Contents		**CLOs**
Tasks		
1	Determination of chemical and morphological properties of pulp.	1, 2, 3
2	Preparation of pulp by using different methods.	1, 2
3	Bleaching of pulp for improving properties.	1, 2
4	Preparation of hand sheet paper and its drying.	1, 2, 3
5	Analysis of paper properties.	1, 2, 3
6	Visit to different pulp and paper mills in Bangladesh (KPM, Basundhara Paper Mills, Dhaka Paper, Hakkani Pulp and Paper Mills etc.)	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Demonstrate different pulping, bleaching, refining and paper making processes.	1, 2
	CLO2	Determine different properties of pulp and paper.	1, 2, 9
	CLO3	Control the quality of pulp and paper	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 4109*	**Year:** Fourth	**Term:** First
Course Title: Wood Modification and Properties Improvement		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		
Rationale	Wood modification is an important branch of wood science which deals with treatment of wood through chemical, thermal and other processes.	

Course Contents		**CLOs**
Section A		
1	**Modifying the properties of wood:** Basic concepts and principles, future prospects of wood modification, wood modification methods, cell wall structure important for modification.	1, 2
2	**Chemical modification of wood:** Reaction protocols, reactions with wood through acetylation, carboxylic acid modification, Isocyanate modification, Aldehyde modification and Cyanoethylation.	1, 2
3	**Thermal modification of wood:** Process variables, heat treatment, steam treatment, microwave treatment, oil heat treatments; compressed wood and staypak.	1, 2
Section B		**CLOs**
4	**Impregnation Modification:** Resin treatments (process, properties and uses of Impreg and Compreg), Impregnation with silicon containing compounds, cell wall impregnation with monomers and polymers.	2, 3
5	**Physical, mechanical, biological and weathering properties of modified wood:** Cell wall chemistry, proof of bonding, effects of modification on cell wall moisture and wood volume, changes in physical, mechanical, biological and weathering properties due to modification.	2, 3
6	**Environmental consideration of modified wood:** Principles of the determination of environmental impacts, method of determining impact of wood modification, environmental impacts of wood modification.	2, 3

Course Learning	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Develop wood modification process	1, 2

Outcomes (CLOs)	CLO2	Demonstrate the wood-based materials, their properties, applications and manufacturing.	1, 2, 9
	CLO3	Find low cost alternatives of wood and conserve forest	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Fengel, D. and Wegener, G. (1984). *Wood: chemistry, ultrastructure and reactions*. Walter de Gruyter, Berlin.
2. Forest Product Laboratory (2010). *Wood handbook: wood as an engineering material* (Centennial Edition). USDA Forest Service, Madison.
3. Hill, C. A. (2006). *Wood modification: chemical, thermal and other processes.* John Wiley & Sons Ltd. UK.
4. Hons, D. N. S. and Shirshi, N. (2001). *Wood and cellulosic chemistry* (2nd edition). Marcel Dekker Inc. New York.
5. Rowell, R. M. (2005). *Handbook of wood chemistry and wood composites*. CRC Press, USA.
6. Sandberg, D., Kutner, A., Karlsson, O. and Jones, D. (2021). *Wood modification technologies: principles, sustainability, and the need for innovation*. CRC Press, Taylor & Francis Group, USA.

Course Code: 0821 05 FWT 4110*	**Year:** Fourth	**Term:** First
Course Title: Wood Modification and Properties Improvement Sessional/ Fieldwork		
Course Status: Optional		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Practical knowledge of wood modification is important to understand the changes and improvement of wood properties.	

Course Contents		**CLOs**
Tasks		
1	Modifying wood through acetylation process, analysis the physical, mechanical and biological properties of acetylated wood.	1, 2, 3
2	Modifying wood through thermal treatment and analysis physical, mechanical and biological properties of modified wood.	1, 2, 3
3	Modifying wood through impregnation treatment and analysis physical, mechanical and biological properties of modified wood.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		Mapping with PLOs
	CLO1	Demonstrate different modification processes of wood	1, 2
	CLO2	Apply the modified wood in different aspects.	1, 2, 9
	CLO3	Transform low quality wood to quality wood	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 4112	**Year:** Fourth	**Term:** First
Course Title: Viva voce		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	A grand viva voce or oral exam is an important learning practice in education in which questions are asked to the student in spoken form and the student has to answer the questions to demonstrate sufficient knowledge of the subject matter.	

Course Contents		CLOs
1	The concerned Examination Committee of current Term will conduct the viva and assess the students	1, 2
2	The Committee will test the depth of basic knowledge regarding relevant subjects learnt so far.	1, 2
3	Questions will be asked on personal views on various issues relevant to forest resource management and conservation.	3, 4
4	Committee will exchange views on professional etiquette suitable for career progression	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		Mapping with PLOs
	CLO1	Demonstrate basic level of understanding on relevant subjects learnt so far.	6, 7
	CLO2	Demonstrate self-confidence in facing a jury board for oral examination in general.	4, 5, 9
	CLO3	Present his/her views convincingly and precisely.	6, 7

	CLO4	Exhibit professional etiquette suitable for career progression	7, 8, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Group Discussion	Viva voce
CLO2	Group Discussion	Viva voce
CLO3	Group Discussion	Viva voce
CLO4	Group Discussion	Viva voce

Course Code: 0821 05 FWT 4114	**Year:** Fourth	**Term:** First
Course Title: Thesis		
Course Status: Core		
Credit: 5.0		
Prerequisite(s): None		

Rationale	It identifies the problem, states the major assumptions, explains the significance of the undertaking, sets forth the sources for and methods of gathering information, analyzes the data, and offers a conclusion or recommendation.

Course Contents		**CLOs**
Tasks		
1	Communication with the Research Supervisor and Co-supervisor (if any).	1, 2, 3
2	Problem identification.	1, 2
3	Preparation research project proposal/concept paper.	1, 2
4	Lab experiments/field data collection and data analysis (qualitative and quantitative).	1, 2, 3
5	Critical thinking and its application.	
6	Thesis writing and submission for partial fulfillment of the degree.	

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Find a research problem.	4, 5
	CLO2	Justify a research problem.	4, 5
	CLO3	Prepare a research project proposal/concept paper.	4, 5
	CLO4	Set laboratory experiments or protocol for field data collection and data analysis (qualitative and quantitative).	6, 7
	CLO5	Perform critical thinking in research.	6, 7
	CLO6	Write a thesis for partial fulfillment of the degree.	6, 7, 9
	CLO7	Draw Conclusion and recommendation based on facts and findings.	6, 7, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture and Presentation	Report Assessment and viva voce
CLO2	Lecture and Presentation	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO5	Lecture and Presentation	Report Assessment and viva voce
CLO6	Lecture and Presentation	Report Assessment and viva voce
CLO7	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0411 05 BA 4151*	**Year:** Fourth	**Term:** First
Course Title: Accounting		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course is designed to acquire knowledge in accountancy and business which is very important in the field of forestry operation.	

Course Contents		**CLOs**
Section A		
1	Planning and operation of Accounting systems flow charting of financial and cost data movement.	1, 2
2	Definition of Book -Keeping objects and advantages of book keeping, principles of double entry Book Keeping.	1, 2
3	The nature of a transaction, classification of accounts, rules for debit and credit.	1, 2
4	Transactions on capital, drawings, bad debits, discount, acquisition and disposal of property, improvement of property, repairs, depreciation, check its kinds and treatment in accounts.	1, 2
5	Journal, cash book with “Bank” column, bank reconciliation statement, imprest system of petty cash.	1, 2
Section B		**CLOs**
6	Ledger posting, balancing and closing	2, 3
7	Trial balance functions, preparation of trial balance, limitations of trial balance.	2, 3
8	Distinction between reserve and provision deprecation, methods of charging depreciation.	2, 3
9	Final Accounts preparation of statement of profit and loss, statement of assets and liabilities, provisions and simple adjustments.	2, 3
10	Forest accounts as followed in the Forest Department.	2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Make plan, budget and manage financial resources.	1, 2
	CLO2	Analyze and evaluate accounting policies and practices**.**	1, 2, 3
	CLO3	Prepare viable business decisions independently.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Franklin, M. Graybeal, P. & Cooper, D. (2019). Principles of Accounting, Volume 1: Financial Accounting. Rice University. Free access: https://assets.openstax.org/oscms-prodcms/media/documents/FinancialAccounting-OP_YioY6nY.pdf
2. Edmonds, T. P., McNair, F. M., Olds, P. R., & Milam, E. E. (2013). *Fundamental financial accounting concepts*. New York, NY: McGraw-Hill Irwin.
3. Takács, A. (2019). Introduction to Accounting.

Fourth Year Second Term

Course Code: 0821 05 FWT 4201	**Year:** Fourth	**Term:** Second
Course Title: Forest Policy and Governance		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	A forest policy offers an overall framework for facilitating sustainable forest management which balances the social, economic, and environmental goals of stakeholders and our society. Improving forest governance is recognized as the focal point to address various drivers of deforestation and forest degradation which ultimately promote sustainable forest management and biodiversity conservation. Therefore, the course is designed with fundamental concepts and theories on forest policy science and forest governance to foster the students' knowledge and skills in managing and conserving forest resources.

Course Contents		**CLOs**
Section A		
1	**Introduction to policy:** Polity, Policy and Politics: basic attributes; various determinants of policy actors; public, private and civil society actors.	1, 2
2	**Policy process:** Policy agenda, policy actor, policy community, policy broker, policy window, rational choice approach, actors' interest and power position, policy negotiation and policy cycle, top-down and bottom-up approach.	1, 2
3	**Policy implementing instruments:** Information instrument, economic instrument and legislative instruments; policy coordination and policy conflict	3, 4
4	**Policy change:** Policy analysis, incremental vs radical policy change; analytical policy program model: policy issue, policy objective, policy implementation and policy impact.	3, 4
5	**Salient features of the forest policy of Bangladesh:** All past and present forest policies and master plans from 1894 to till to date.	3, 4
Section B		**CLOs**
6	**Forest issues:** Forests, forest values, forest issues, global forest issues, forest issues in Bangladesh; deforestation and forest degradation; drivers of deforestation and forest degradation in the global context and in Bangladesh	
7	**Governance in general:** Definition, concepts, principles; evolution of governance; types of governance; governance norms	3, 4
8	**Forest governance in particular:** Definition, concepts, history and evolution forest governance; elements of forest governance; qualities of governance; global forest governance; climate change governance; forest	4, 5

	and climate change governance; local, national and global actors in forest governance	
9	**Pillars and principles of forest governance:** Policy, legal, institutional and regulatory framework; planning and decision-making process; implementation, enforcement and compliance; principles like participation, transparency, accountability; efficiency; effectiveness; fairness/equity	4, 5
1 0	**Governance mode/shift:** Hierarchical governance, market governance, civil society governance; governance triangle	4, 5
11	**Decentralized forest governance:** Concept, definition, history, types of decentralization and devolution of power.	4, 5
12	**Forest governance instruments:** Forest stewardship council, FLEGT, ITTA, REDD+	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Demonstrate the common and important terms and topics of public policy.	1, 2
	CLO2	Explain the policy process from agenda setting to policy adoption and policy evaluation.	4, 5, 9
	CLO3	Describe the current forest related policy and plans in Bangladesh.	6, 7, 9
	CLO4	Explain forest governance and good governance.	6, 7, 9
	CLO5	Evaluate the current international and national forest governance issues and processes.	6, 7

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO6	Lecture and Group Discussion	Viva voce and Final Exam.

Learning Materials

Recommended Readings

1. Arnouts, R., van der Zouwen, M., Arts, B. (2012). Analyzing governance mode and shifts. Forest Policy and Economics.
2. Arts, B. (2006). Non-state Actors in Global Environmental Governance. New Arrangements beyond state. In Koenig-Archibugi et al. (eds.), *New Modes of Governance in the Global System.*
3. Arts, B. (2021). Forest Governance: Hydra or Chloris. Cambridge University Press.

4. Arts, B., Behagel, J., Turnhout, E., de Koning, J., van Bommel, S. (2014). A practice based approach to forest governance. Forest Policy and Economics.
5. Bemelmans-Videc, M. L., Rist, R. C., & Vedung, E. O. (Eds.). (2011). *Carrots, sticks, and sermons: Policy instruments and their evaluation* (Vol. 1). Transaction Publishers.

Supplementary Readings

6. Böcher, M., Giessen, L., & Kleinschmit, D. (Eds.). (2008). *Environmental and Forest Governance: The Role of Discourses and Expertise; Proceedings of the International Conference, Göttingen 2007*. Universitätsverlag Göttingen.
7. Borrini-Feyerabend, G., Johnston, J., & Pansky, D. (2006). Governance of protected areas. In M. Lockwood, G. Worboys, & A. Kothari (Eds.), Managing protected areas: A global guide (pp. 116-145). London, Sterling, VA: Eartscan.
8. Burroughs, R. (2011). Coastal governance. Washington, DC: Island Press.
9. Cowling, P., DeValue, K., & Rosenbaum, K. (2014). Assessing Forest Governance: A Practical Guide to Data Collection, Analysis, and Use. Washington DC: PROFOR and FAO.
10. Kingdon, J.W., (2003). Agendas, Alternatives and Public Policies. Addison-Wesley Educational Publishers Inc., New York.
11. Kishor, N., & Rosenbaum, K. (2012). Assessing and monitoring forest governance: a user's guide to a diagnostic tool. Washington DC: Program on Forests (PROFOR): Program on Forests (PROFOR).
12. Knill, C., & Tosun, J. (2012). Public policy: a new introduction. New York: Palgrave Macmillan.
13. Knoepfel, P., Larrue, C., Varone, F., & Hill, M. (2007). Public policy analysis. Bristol: Policy Press.
14. Kooiman, J. (2003). Governing as governance. London: SAGE.
15. Krott, M. (2005). *Forest policy analysis*. Springer Science & Business Media.
16. Lockwood, M., Davidson, J., Curtis, A., Stratford, E., Griffith, R. (2010). Governance Principles of Natural Resources Management. Society of Natural Resources.
17. Mårald, E., Sandström, C., & Nordin, A. (2017). *Forest governance and management across time: developing a new forest social contract*. Routledge.
18. Mintrom, M. (2012). Contemporary policy analysis. Oxford; New York: Oxford University Press.
19. Moore, P., Zhang, X., Triraganon, R. Natural Resource Governance. Trainer's manual.
20. Rametsteiner, E. 2009. Governance concepts and their application in forest policy initiatives from global to local levels. Small-scaled Forestry.
21. Sadath, N. (2012). *Media as a driver of policy change?: the example of forest-climate policy in Bangladesh*. VVB Laufersweiler.
22. Turke, R.-E. (2008). Governance. Dordrecht: Springer Netherlands.

Course Code: 0821 05 FWT 4202	Year: Fourth	Term: Second
Course Title: Forest Policy and Governance Sessional/Fieldwork		
Course Status: Core		
Credit: 1.0		
Prerequisite(s): None		
Rationale	The sessional/ fieldwork course is needed to make the student understand the policy and governance process.	

Course Contents		CLOs
Tasks		
1	Analysis of policy program documents and policy implementation (content analysis, FGD and KPI).	1, 2, 3
2	Fieldwork for Policy actors/stakeholder analysis.	1, 2
3	Participation in role playing in virtual and hypothetical policy negotiation.	1, 2
4	Interviewing of policy actors for policy network analysis.	3
5	Comparative policy regime analysis on national and internal policy analysis.	4, 5
6	Final report writing.	4, 5

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Conduct a policy actor/stakeholder analysis.	1, 2
	CLO2	Carry out content analysis of policy program documents.	4, 5, 6
	CLO3	Conduct a policy network analysis.	7, 8, 9
	CLO4	Independently conduct FGD, KPI, and other concerned tools for data collection.	7, 8, 9
	CLO5	Describe the policy negotiation process.	7, 8

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce
CLO4	Lecture and Presentation	Report Assessment and viva voce
CLO5	Lecture and group discussion	Report Assessment and viva voce

Course Code: 0821 05 FWT 4203	Year: Fourth	Term: Second
Course Title: Forest Law and Administration		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	In order to become a professional forester a student must have the knowledge regarding forest related laws, regulations and administration.	

	Moreover, s/he should know forest related international treaties and protocols. Hence, this course has been designed as an integral part of the forestry undergraduate program to understand all these aspects of forestry.

Course Contents		**CLOs**
Section A		
1	**Legislation process in Bangladesh:** Legislation proposal, white paper, green paper, vetting, approval, and history of forest law in Indo-Bangladesh.	1, 2
2	**Definition of common legal terms used in forest administration:** Abetment, cognizable and non-cognizable offences, collusion, confession. compounding offence, seizure, confiscation, mischief, mistake of fact, pre-emption, recognizance, royalty, salvage, search warrant, servitude, summary trials, warrant cases, wasteland, government property, rights and ownership.	1, 2
3	**Legal classification of forests in Bangladesh:** Constitution of reserved forest and protected area, jurisdiction of Forest Departments over forest resources in Bangladesh.	1, 2
4	**Forest act and rules:** Section by section study of Forest Act 1927 and Forest Ordinance 1989 (Amendment 2000) including punishment for different forest offences, forest cases; Protected Area Management Rules 2017; Transit rules for Sundarbans Reserved Forest, hill forest; Social Forestry Rules 2004 (Amendment 2011), Sawmill Rule 2012, Brick burning control Act 2013, Private Forest Ordinance 1959, other rules and regulations in forestry sector since 1959 till up to date.	1, 2
5	**Legal organization of forestry services:** Definition of forest officer; job of forest officer, appointment, powers and limitations of forest officers, special obligations; protection extended by law to forest officers; legal powers of forest officers.	1, 2
6	**Relevant Land laws of Bangladesh:** Articles related forest land records.	1, 2
7	**Treaties:** MIKE, CITES, CBD, UNFCC, COP, RAMSAR, CITES, UNCCD, GTI, WHS	1, 2
Section B		**CLOs**
8	**Introduction of administration:** Definition of administration, nature, significance, principles, public and private administration, differences between administration and management, characteristics of a good administrator, managing meetings and sessions, participatory needs assessment, activity planning and management, decision making and problem solving.	3, 4
9	**Legal organization of forestry services:** Definition of forest officer; job of forest officer, appointment, powers and limitations of forest officers,	3, 4

	special obligations; protection extended by law to forest officers; legal powers of forest officers.	
10	**Leaderships in forestry administration:** Introduction of leadership; organizational leadership; differences between leadership and management; building effective teams; democratic-autocratic-Laissez-faire; applications of different types of leadership in forestry (e.g. trait leadership, skills leadership, behavioural leadership, situational leadership, adaptive leadership, servant leadership, and authentic leadership).	3, 4
11	**Public administration in Bangladesh:** Introduction, structure, reforms, Bangladesh Civil Service, innovation in Bangladesh Civil Service, gender issues in civil service, human resource management, bureaucracy in Bangladesh, major challenges of public administration in Bangladesh, forest administration of Bangladesh.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Demonstrate the legislation process.	1, 2
	CLO2	Demonstrate different section subsection of forest laws of Bangladesh.	1, 8, 9
	CLO3	Explain the process and bindings of different international treaties and protocols.	1, 8, 9
	CLO4	Describe different aspects of administration and forest administration of Bangladesh.	1, 8, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Ahmed, N. (ed.). (2014). 40 Years of Public Administration and Governance in Bangladesh. The University Press Limited.
2. Henry, N. (2015). Public administration and public affairs. Routledge.
3. Murphy, G. (2006). How legislation is drafted and enacted in Bangladesh. Statute Law Review, 27(3), 133-149.
4. Perry, J. L., & Christensen, R. K. (2015). Handbook of public administration. John Wiley & Sons.

5. Rahman, L. M. (2005). Policy, law and administration for protected area management in Bangladesh. Nishorgo Support Project.
6. Sabharwal, M., & Berman, E. M. (Eds.). (2013). Public administration in south Asia: India, Bangladesh, and Pakistan. CRC Press.
7. Shafritz, J., Russell, E. W., Borick, C., & Hyde, A. (2016). Introducing public administration. Routledge. Free access available.
8. The Forest Act, 1927 (Act no. XVI of 1927).

Course Code: 0821 05 FWT 4205	**Year:** Fourth	**Term:** Second
Course Title: Mangrove Resources Management and Utilization		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		
Rationale	This course is designed for the 4th year students of Forestry and Wood Technology Discipline. Students of this course are expected to learn the principles of mangrove resources management.	

Course Contents		**CLOs**
Section A		
1	**Introduction:** Different types of resources available in the mangrove ecosystems, their present status; Values of mangroves: Economic and ecological services of mangroves.	1, 2
2	**Mangrove resource overview:** Mangrove resource uses, causes of losses of mangroves and conservation initiatives in different areas. Values, ethics and attitude towards mangrove resource management.	1, 2
3	**Economic consideration in mangrove management:** Integrated and adaptive mangrove management: excessive extractive use, reclamation and foreshore development, mangroves and global climate change; management tools.	1, 2
4	**Threats and challenges:** Threats on biodiversity and management challenges for the Sundarbans.	1, 2
Section B		**CLOs**
5	**Mangrove restoration:** Objectives, Planning and layout of plantation, Site selection and management, Tending operation, Natural and assisted regeneration, Composition, control and enrichment planting.	3, 4
6	**Silvicultural systems and management:** Silvicultural systems used in the mangroves of the world, their problems and prospects; comparative study of the silvicultural systems followed in the Sundarbans, Matang mangrove of Malaysia, Thailand, Indonesia, possibilities of interdicting new systems in the Sundarbans.	3, 4
7	**Non-commercial cover (NCC) land management:** Economic utilization of NCC lands, introduction of exotic/mainland species particularly on raised NCC land.	3, 4

8	**Alternate use of mangroves:** Potential for alternative uses of mangrove areas and their possible impact on the environment with particular reference to the Sundarbans; potential for wildlife, fisheries, and apiculture; management and development of tourism with particular reference to ecotourism in the Sundarbans, their problems and prospects.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Know the type of resources available in mangrove ecosystem	1, 2
	CLO2	Know the causes of mangrove destruction and conservation initiatives in different areas.	1, 2
	CLO3	Know the economic consideration in mangrove management	1, 2
	CLO4	Understand the process of mangrove conservation and restoration.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Aksornkoa, S. 1993. Ecology and Management of Mangroves. IUCN, Thailand.
2. Chaudhuri, A.B. & Chudhury, A. (Eds.) 1994. Mangroves of the Sundarbans. Vol.1: India, IUCN.
3. Das, S. & Siddiqi, N.A. 1985. The Mangroves and Mangrove Forests of Bangladsh. Mangrove Silviculture Division Bulletion No. 2 Bangaldesh Forest Research Institute, Chittagong.
4. FAO. 1993. Mangrove Area Management Guidelines. Forestry Technical paper No.117.
5. Hamilton, L.S. & Snedaker, S.C. (Eds.) 1984. Handbook for Mangrove Area Management, UNDP/IUCN.
6. Hussain, Z. & Acharya, G. (Eds.) 1994. Mangroves of the Sundarbans, Vol. 11: Bangladesh, IUCN.
7. Hutchings, P. & Seanger, P. 1987. Ecology of Mangroves. University of Queensland Press, Australia.
8. Nasker, K. & Bakshi, D.N.G. 1987. Mangrove Swamps of the Sundarbans. Naya Proksh, India.

Course Code: 0821 05 FWT 4207*	**Year:** Fourth	**Term:** Second
Course Title: Forest Biodiversity and Protected Area Management		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		

Rationale	Forest biodiversity assessment and protected area protection is a global agenda for forest conservation need to incorporate in academia. The conservation of forest biodiversity and protected area management are intertwined. Currently, the Government of Bangladesh is focusing these two priorities as their main focus resulted various development projects to manage and conserve their forest areas particularly since last two decades. Therefore, this course has been designed to address various aspects and issues of forest biodiversity and protected area management.

Course Contents		**CLOs**
Section A		
1	**Introduction:** Definition and types of biodiversity; status and importance of studying biodiversity	1, 2
2	**Some basic terms related to forest biodiversity:** Species richness, abundance, species similarity, species diversity, species dominance (importance value), species area curve relationships /species accumulation, spatial distribution pattern of trees, species spatial association of trees/species co-existence.	1, 2
3	**Trends of biodiversity:** Threats identification; causes, effects and measures of biodiversity loss/gain, indicator and criteria of forest biodiversity.	1, 2
4	**Biodiversity measurement:** Sampling techniques for biodiversity assessment; qualitative and quantitative assessment of forest biodiversity using popular biodiversity indices.	1, 2
5	**Management and conservation:** Management of habitat, ecosystem and species (invasive, exotic, endangered, threatened species); biodiversity hotspot and its management; importance and problems of forest biodiversity conservation in Bangladesh, biodiversity conservation for sustainable forest management, biodiversity related law and policy in Bangladesh.	1, 2
Section B		**CLOs**
6	**Introduction:** History, concepts, objectives, importance and legal status of protected area.	3, 4
7	**Human and nature:** The role and understanding of culture-nature dynamics in human-environment relation, political ecology, nature-human conflict and conflict management.	3, 4
8	**Protected area categories:** IUCN protected area management categories.	3, 4

9	**Protected areas of Bangladesh:** Problems and prospects, objectives, existing management systems, concepts and principles of co-management, co-management in Bangladesh; history, types and status.	3, 4
10	**Planning process and management strategies:** The management plan, developing zoning plans, financing and budgeting, management practices, limits of use, public participation in planning and management.	3, 4
11	**Protected area management cases:** Lawachara, Chunoti, Rema-Kalenga, Masi Mara Reserve, Yellowstone National Park, etc.	

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Describe biodiversity and its importance to forest ecosystem.	1, 2
	CLO2	Apply the biodiversity knowledge for forest management and conservation.	1, 2, 9
	CLO3	Measure biodiversity indices.	1, 2, 9
	CLO4	Know how to manage protected areas.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Ahsan, M. M., Aziz, N., & Morshed, H. M. (2016). Assessment of management effectiveness of protected areas of Bangladesh. Free access available.
2. Basnet, K. (2010). Shifting Paradigms in Protected area Management. Tribhuvan University Journal, 27(1-2), 227-230.
3. Dudley, N. (Ed.) (2008). Guidelines for applying protected area management categories. Gland: IUCN.
4. Hill, S. L. L., Arnell, A., Maney, C., Butchart, S. H. M., Hilton-Taylor, C., Ciciarelli, C., . . . Burgess, N. D. (2019). Measuring Forest Biodiversity Status and Changes Globally. Frontiers in Forests and Global Change, 2(70). Free access: https://www.frontiersin.org/articles/10.3389/ffgc.2019.00070/full
5. Hockings, M. (2006). Evaluating Effectiveness: A framework for assessing management effectiveness of protected areas: IUCN.

Supplementary Readings

6. Huston M. A. (1994) Biological Diversity. Cambridge University Press, Cambridge, 681 pp.

7. Magurran A. E. (1988) Ecological Diversity and Its Measurement. Princeton University Press, 261 pp.
8. Pielou E. C. (1969) An Introduction to Mathematical Ecology. John Wiley & Sons, Inc., New York, 286 pp.
9. Secretariat of the Convention on Biological Diversity. (2010). Forest Biodiversity—Earth's Living Treasure. Retrieved from Montreal: https://www.cbd.int/idb/doc/2011/idb-2011-booklet-en.pdf
10. Shaheed, M., & Chowdhury, H. (2014). Forest conservation in protected areas of Bangladesh: policy and community development perspectives. Switzerland: Springer.
11. Thomas, L., & Middleton, J. (2003). Guidelines for management planning of protected areas (Vol. 10). Gland, Cambridge: IUCN.
12. Tomback, D. F. E. (2019). Biodiversity and conservation in forests. Switzerland: MDPI. Link (free access): https://www.mdpi.com/books/pdfview/book/1099
13. Whitmore, T. C. (1998) An introduction to tropical rain forests. Oxford University Press, New York.
14. Wilson, E. O. (1988) Biodiversity. National Academy Press. Washington DC.

Course Code: 0821 05 FWT 4208*	**Year: Fourth**	**Term: Second**
Course Title: Forest Biodiversity and Protected Area Management Sessional/Fieldwork		
Course Status: Optional		
Credit: 1.0		
Prerequisite(s): None		
Rationale	Biodiversity assessment is vital for protected area management and conservation. Students will have the opportunity to visit forest and protected areas to take part in practical sessions by which they can make scientific observations on living species, biodiversity assessment and co-management approach.	

Course Contents		**CLOs**
Tasks		
1	Field survey and laying out biodiversity sampling plot and data collection.	1, 2, 3
2	Preparation of herbarium for plant species identification.	1, 2
3	Analysis of data using biodiversity parameters and indices in the laboratory.	1, 2
4	Field trip to different protected areas in Bangladesh.	1, 2, 3
	Report writing.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Identify species and their preservation by the preparation of herbarium.	1, 2
	CLO2	Apply sampling technique of biodiversity assessment and measurement of biodiversity parameters.	1, 2, 9

	CLO3	Assess and analyze the co-management approach for protected area management.	1, 2, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 4209*	**Year: Fourth**	**Term: Second**
Course Title: Urban Forestry and Arboriculture		
Course Status: Optional		
Credit: 3.0		
Prerequisite(s): None		
Rationale	The course Urban Forestry and Arboriculture is designed to meet the demand of urban environment dealing with trees and forests of the urban areas. Special training is required to manage urban trees to satisfy multiple demands of the urban society. This particular course will enable students to understand theories and adopt training for management of urban trees and forests.	

Course Contents		**CLOs**
Section A		
1	**Urban ecology:** Definition and classification of urban areas, ecology of urban areas, growth of cities and concern for urban environment, principles for ecocity development.	1, 2
2	**Urban forest:** Definition, concept and classification, history of urban forestry, societal benefits and uses of the urban forests, urban climate, air quality, noise abatement, soil and water conservation.	1, 2
3	**Urban forest planning:** Stakeholders, planning procedure and implementation, liability and legal aspects of urban forestry.	1, 2
4	**Urban forest management**: Species selection, street tree management, green open space management, biodiversity conservation, threats of exotic and invasive species in urban environment.	1, 2
5	**Measuring urban forests:** post-plantation evaluation, hazard tree evaluation, street tree inventory, valuation of urban trees.	1, 2
Section B		**CLOs**
6	**Arboriculture:** Definition, scope and importance.	3, 4
7	**Trees in urban setting:** Tree selection, tree structure and function, tree and environment relationships, preserving existing trees, preventative	3, 4

	maintenance and repair, tree planting, tree architecture and aesthetics with special reference to urban landscape.	
8	**Cultural practice:** Diagnosing soil and site problems, planting and early tree care, transplanting, silviculture, pruning and line clearing, lopping and topping, and tree surgery.	3, 4
9	**Water and nutrient management:** Water conservation and use, fertilization, insecticides and herbicides used, and pest management.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Understand the social needs, values, natural complexity and interdisciplinary nature of the urban forests.	1, 2
	CLO2	Evaluate tree structure, stability and design sites to support trees.	1, 2
	CLO3	Interpret internal tree conditions from visual signs.	1, 2
	CLO4	Analyze data describing the biological, physical and social aspects of urban forest.	1, 2

Mapping CLOs with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture	Quiz and Continuous Assessment
CLO2	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO3	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.
CLO4	Lecture and Presentation	Continuous Assessment, Assignment and Final Exam.

Learning Materials

Recommended Readings

1. Horn, B. 1980. The Oxford Encyclopedia of trees of the world. Oxford University Press,288pp.
2. Spurr, S. H. and Barnes, B. V. 1980. Forest Ecology. John Wiley & sons.
3. Zabala, N. Q. 1990. Lecturer notes in world forestry. UNDP/FAO Project No. BGD/85/011 Development of Professional Education in the Foirestry sector in Bangladesh. 84 pp.

Course Code: 0821 05 FWT 4212	**Year:** Fourth	**Term:** Second
Course Title: Forest Management Plan Sessional/Fieldwork		
Course Status: Core		
Credit: 3.0		
Prerequisite(s): None		

Rationale	A forestry student should be able to translate the forest management theoretical knowledge to practice hence the forest management sessional/ filed work course is vital for the forestry under graduate program.

Course Contents		**CLOs**
Tasks		
1	Collection of baseline information of the target forest management unit.	1, 2, 3
2	Fieldwork to collect the vegetation inventory data of the target forest management unit.	1, 2
3	Performing fieldwork to collect the social, wildlife abundance, economic and marketing of products and services data of the targeted forest management unit.	1, 2
4	Preparation of forest management plan.	1, 2, 3

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Prepare species wise volume table.	1, 2, 3
	CLO2	Prescribe management strategy for the specific site.	4, 5, 6
	CLO3	Prepare a comprehensive forest management plan for production forest, recreational forest, protected forest.	7, 8, 9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Lecture and Presentation	Report Assessment and viva voce

Course Code: 0821 05 FWT 4214*	**Year: Fourth**	**Term: Second**
Course Title: Forestry Internships		
Course Status: Optional		
Credit: 2.0		
Prerequisite(s): None		
Rationale	This course will provide opportunities to the students to achieve practical experiences in forest and wood science sectors. They will have the opportunity to participate in a short internship at relevant organizations related to their research interests. These organizations might be government, non-government, private, international, and so on.	

Course Contents Tasks		CLOs
1	Participation in practical assignments (research works/ teaching and research works/office services/field level management works) related to selected forest, forestry and wood science sectors.	1, 2, 3
2	Preparing an internship report based on gained working experiences.	3, 4

Course Learning Outcomes (CLOs)	Upon completion of this course the students will be able to:		**Mapping with PLOs**
	CLO1	Be familiar with the formal working environment related to forestry and wood science sectors.	1, 2
	CLO2	Learn how to conduct systematic research on any forestry and wood science sectors related issue.	1, 2, 9
	CLO3	Manage office works as well as operate field level works.	1, 2, 9
	CLO4	Write an internship report.	9

Mapping CLOs with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO2	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO3	Field visit to different forests and relevant organizations	Report Assessment and viva voce
CLO4	Lecture and Presentation	Report Assessment and viva voce

OUTCOME-BASED CURRICULUM

PART- D

20. Grading and Evaluation

20.1 Grading Scale

a) Letter Grades and corresponding Grade Points will be awarded following provisions shown below:

Numerical Grade	Letter Grade	Grade Point
80% or above	A+ (A plus)	4.00
75 to less than 80%	A (A regular)	3.75
70 to less than 75%	A- (A minus)	3.50
65 to less than 70%	B+ (B plus)	3.25
60 to less than 65%	B (B regular)	3.00
55 to less than 60%	B- (B minus)	2.75
50 to less than 55%	C+ (C plus)	2.50
45 to less than 50%	C (regular)	2.25
40 to less than 45%	D	2.00
Less than 40%	F	00
Incomplete	I	
Withdrawn	W	
Continuation (for the project, thesis design, etc. course)	X	

20.1.1 Evaluation of Theory Courses

a) All theory courses will be evaluated out of 100 marks, the distribution of which is given below:

Sl. No.	Items	Marks
1	Attendance and Class Participation	10
2	Continuous Assessments	30
3	Term Final Examination	60
	Total	**100**

b) The basis for awarding marks for class attendance and participation will be as follows:

Attendance & Participation	Marks
90% or above	10
85 to below 90%	9
80 to below 85%	8
75 to below 80%	7
70 to below 75%	6
65 to below 70%	5
60 to below 65%	4
Below 60%	0

c) The continuous assessments of the theory courses may be conducted in the form of class tests, assignments, homework, presentation, quiz, viva voce, etc. The course teacher(s) will evaluate every continuous assessment and share the result with the students within 2(two) weeks of conducting that continuous assessment.

d) The duration of a class test may be 20-45 minutes, and it will preferably be given during class hours.

e) If a student does not attend the class test for reasons satisfactory enough to the course teacher, the course teacher may allow the student one more chance for such assessment during the term; however, it must be held before the term final examinations. A student who has been absent for a short period, up to a maximum of three weeks due to illness, should approach the course teacher(s) or Coordinator(s) for make-up of quizzes/class tests or assignments, etc., immediately on returning to the classes. Such request should be supported by a medical certificate endorsed by the Chief Medical Officer of the University. The medical certificate issued by a registered medical practitioner (with the registration number shown explicitly on the certificate) and endorsed by the Chief Medical Officer of the University will also be acceptable only when the student has valid reasons for his/her absence from the University.

f) The number of Continuous Assessments (CAs) in each course will be as follows:

No. of credit(s)	Total no. of CA required	CAs to be considered for grading
3 - 4	4 (2 in each section)	Section best assessments shall be averaged for grading
1.5 - 2	3 (at least one in each section)	

g) If two teachers teach a course, both the teachers will conduct continuous assessments individually.

h) Answer scripts of the continuous assessment may be shown to the students to identify their strengths and weaknesses, but those would not be returned to them. The concerned teacher would submit the evaluated continuous assessment answer scripts and attendance register to the Head of the Discipline/Program Offering Entity (POE). The final score of attendance and class participation (out of 10) and continuous assessment (out of 30) should be displayed on the Discipline's notice board/ Discipline website/ Course web page before starting the term final examination.

i) The course teachers must submit the continuous assessment mark sheets to the Chair of the Examination Committee before the starting of the term final examination.

j) The Term Final Examination will carry 60 marks. There will be two separate answer scripts for Section A and Section B in the Term Final Examination.

k) When a student repeats a course in which he/she previously obtained an F grade, he/she will be given just an immediate lower grade that he/she obtained in the repeated course. However, in case he/she obtains a D grade, that will be maintained, and this grade will be shown in the transcript. If a student has to repeat a course due to punishment on him/her, the grade obtained will be maintained. If a student obtains a grade other than an F in a course, he/she will not be allowed to repeat the course for grade improvement.

l) If a student obtains an 'F' grade in any Core course in any term, this 'F' grade will not be counted for Grade Point Average (GPA) but will be shown on the grade sheet, and in such case, he/she will have to retake the course for grade improvement.

m) While registering for a retake/re-retake theoretical course, a student must be given an option to decide whether s/he intends to sit for continuous assessment of the course. If s/he opts to sit for continuous assessments, his/her fresh mark will be counted to prepare the result. However, the class attendance and participation marks will be taken from the previous record.

n) A student has to register for the backlog/retake/re-retake core courses first followed by the fresh courses offered by the Discipline for the term s/he is going to enroll subject to the compliance with: **(i)** completion of prerequisite courses (if any) and **(ii)** maximum registration limit of 25 credits per term. However, s/he may not choose to register the optional backlog/retake/re-retake courses first.

o) In addition, a student may be allowed to register for advance course(s) in a term subject to: **(i)** his/her all backlog/retake/re-retake and offered core courses are either clear or registered, **(ii)** his/her current terms' offered all core courses are registered, **(iii)** completion of corresponding prerequisite courses (if any), **(iv)** compliance with a maximum registration limit of 25 credits per term, and **(v)** the desired advance courses are offered by the Discipline/POE in the current term. However, such advance course registration option will not be applicable for capstone courses like Thesis/ Project/ Internship/ Research study/ Monograph/ Portfolio, and so on.

p) A Special Term may be offered for the final year students who have retake/re-retake course(s). In this case, the maximum credit limit for a student will be 15 credits. This will be a Non-Taught Term. The Examination of Special Term will start 4 (four) weeks after publishing 4th-year 2nd Term results and will continue not more than 2 (two) weeks. The continuous assessment marks (40%) will be carried over from previously registered theory course(s), and Special Term Final Examination will carry the remaining (60%) marks. Final Year Term Thesis/Dissertation/Design or Core Sessional(s) supervisor(s)/course teacher(s) in consultation with the Head may allow the student(s) to re-submit the Thesis/Dissertation Design or Core Sessional(s) within the Special Term schedule. However, it must be within the allowed limits of the Special Term credits.

20.1.2 Evaluation of Sessional Courses

a) All sessional courses will be evaluated out of 100 marks, the distribution of which is given below:

Sl. No.	Items	Marks
1	Attendance/Class Participation/Contact with teachers	10
2	Sessional Evaluation/Internal criticism/Observation	60
3	Viva Voce/ Final Jury	30
	Total	**100**

b) Sessional evaluation would be done through a laboratory test, class test, quiz, assignment, assigned project, report, oral test, performance/behavior of the students, etc. The course teacher(s) will complete every sessional evaluation and share the result with the students within 2(two) weeks of conducting that item. Attendance and sessional evaluation mark sheets (out of 10+60=70) will be displayed on the Discipline's notice board/Discipline website/Course web page before starting the term final examination.

c) Viva Voce of each sessional course will usually be conducted by the course teacher(s). The senior most among the course teachers (if any) will be the Chair of the viva board. However, such viva voce/final assessment of a sessional course can also be done through jury board in applicable cases. The jury board will be headed by the Head of the Discipline or any other senior teacher of the Discipline/POE not below the rank of Assistant Professor. The Chairman of the viva/jury board may appoint other teacher(s) as a board member if necessary. A student must attend a sessional evaluation and viva voce. In case of absence in any component, he/she will get an F grade in that course.

d) The course teachers must submit the continuous assessment mark sheets to the Chair of the Examination Committee before the starting of the term final examination.

e) A student may register sessional courses as retake/re-retake (if applicable) on the Discipline Head's written approval. For retake/re-retake sessional courses, no previous records/marks will be counted.

20.1.3 Evaluation of Capstone Courses

a) The distribution of marks for a Capstone (Thesis/ Monograph/ project paper/ etc.) course will be as follows:

No.	Description	Marks
i)	Contact/Discussion/Communication with the Supervisor	10
ii)	Evaluation	60
iii)	Oral presentation and/or Viva voce	30
	Total	**100**

b) There will be two examiners (including the Supervisor) to examine the Thesis. Each examiner will evaluate the Thesis separately, and the average marks will be considered for grading. However, if the marks given by the First and Second Examiners vary 20% or more, a Third Examiner to be appointed by the concerned Examination Committee from the outside the University will evaluate the Thesis Monograph/Project paper. Among these numbers, the average of the closest two numbers will be considered for grading. However, if the marks given by the Third Examiner happen to stand at the middle of the marks given by the first two Examiners, the average of the three marks will be considered for grading.

c) For the thesis/dissertation/final project/other projects like the thesis of the final year students, there will be a presentation and defense session before the board (Jury/ other board). If deemed necessary to the concerned Examination Committee, these sessions might be arranged online. The chairman of the board normally will be the Discipline Head or any other senior teacher of the Discipline/POE not below the rank of an Assistant Professor. All supervisors of the thesis/ project/ internship/ research study/ monograph/ portfolio courses will be the concerned board members. The chairman may appoint other teacher(s) as member(s). Every member of the board will evaluate individually and the final marks will be calculated by averaging all the marks given by the members.

d) A Discipline might allow some students to register for an Internship program/ Project paper/ Monograph/ Research study according to the course curriculum of the respective Discipline. Such an internship program/ Project paper/ Research study course might be considered as the substitute of Thesis for those students. The evaluation and related activities of such Internship program/ Project paper/ Research study courses will be similar to Thesis. Usually, a Thesis will carry double weight in terms of credit compared to other alternatives like Project/ Internship/ Research study/ Monograph/ Portfolio and so on.

e) A Discipline might allow splitting the thesis/similar course into more than one term. ‘X’ grade may be assigned for continuing the same course in multiple terms to assign a complete grade in the last term. Alternatively, multiple courses under thesis/similar course might be assessed by providing complete grades at the end of each term. The curriculum of the concerned Discipline/Entity will clarify all such issues.

20.1.4 Evaluation of Viva Voce

a) There might be a grand viva voce in each term. A student will not usually be allowed to register for more than one course of this type bearing 01 (one) credit in a term. The concerned Examination Committee of that Term will conduct the viva and assess the students. The distribution of marks for viva voce will be as follows:

Description	Marks
Viva voce	100

20.2 Grades

Grade related issues are reported in section 20.1.

20.3 Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

a) Grade Point Average (GPA) is the weighted average of Grade Points obtained in all the courses passed/completed by a student. For example, if a student has passed/completed five courses in a term having credits of C1, C2, C3, C4, and C5 and his/her points in these courses are G1, G2, G3, G4, and G5, respectively, then,
GPA = ∑CiGi/∑Ci

b) A Numerical Example: Suppose a student has completed five courses in a term and obtained the following grades:

COURSE	CREDIT	GRADE	GRADE POINT
A	3	A+	4.00
B	3	C+	3.00
C	3	A	3.75
D	2	B	3.25
E	1	B+	3.50

Then his/her GPA for the term will be computed as follows:
GPA= 3(4.0) + 3(3.0) + 3(3.75) + 2(3.25) + 1(3.5) / (3 + 3 + 3 + 2 + 1) = 3.52

c) A student's performance will be evaluated in terms of three indices- Term Grade Point Average (TGPA), Yearly Grade Point Average (YGPA), and Cumulative Grade Point Average (CGPA). The TGPA is computed by dividing the total points earned in a Term by the number of credits taken in the Term. The YGPA is computed by dividing the total grade points earned in two Terms in a year by dividing the number of credits taken in that year. The CGPA is computed by dividing the total grade points accumulated till date by the total completed credits. Thus a student who has earned 275 grad points in attempting 100 credits of courses would have an overall CGPA of 2.75.

20.4 Course Withdrawal

a) ‘W’ is the corresponding grade for withdrawn of a course, as mentioned in section 20.1.

b) If any student cannot complete the Term Final Examination due to severe illness or serious accident, he/she may apply to the Dean through the Head of the concerned Discipline for total withdrawal from the Term within eight working days after the Term Final Examination. However, he/she may choose not to withdraw from any sessional course if the grade obtained in such a course is C or better. A medical certificate endorsed by the Chief Medical Officer of the University must support the application. The Dean of the concerned School will decide on such an application and inform the Academic Council. If a student is allowed to withdraw from a Term, he/she will have to register as fresh from the Term he/she has withdrawn. However, he/she may be allowed to register for backlog courses, if offered.

20.5 Incomplete (I) Courses

‘I’ is the corresponding grade for an incomplete course, as mentioned in section 20.1.

20.6 Retake

Retake related issues are reported in sections 20.1.1 and 20.1.2.

20.7 Grade Improvement

Grade improvement related issues are reported in section 20.1.1.

20.8 Dropout/Cancellation of Studentship

a) A first-year first term student's admission will stand cancelled if he/she fails to complete course registration by ten working days from the beginning of the classes.

b) A first-year first term student's admission will stand cancelled if he/she fails to attend at least 50 percent of classes during ten working days from the beginning of the classes. However, in case of severe illness/accident this provision may be relaxed subject to submission of a medical certificate issued by a registered medical practitioner (with the registration number shown explicitly on the certificate) and endorsed by the Chief Medical Officer of the University.

c) A student's studentship will stand cancelled if he/she fails to comply with registration of minimum credit requirements under article 12.2 of the latest (July 2022) 'Ordinance for Undergraduate Program' of Khulna University. According to that article, a student must register for at least 15 credits per term and may be allowed to register for up to a maximum of 25 credits if recommended by his/her Discipline Head. The Discipline/POE might offer less than, greater than or equal to 25 credits per term as per the approved curriculum. The student will enjoy the option of choosing backlog, re-take, re-retake, advance courses (subject to compliance with applicable requirements/restrictions, as reported in other articles of the Ordinance) in addition to fresh courses to comply with the restriction of maximum 25 credits per term. If any student fails to register, in any way, for minimum credits (15 credits), his/her studentship at the University will stand canceled. This minimum 15-credit registration limit may be relaxed if: (i) the student requires less than 15-credit to complete his/her graduation, or (ii) the sum of applicable (for the student) credits offered by the Discipline is less than 15-credit in the corresponding term for any valid reason.

d) A student's studentship will stand cancelled if he/she fails to earn minimum credits under article 12.5.2 of the latest (July 2022) 'Ordinance for Undergraduate Program' of Khulna University. According to that article, when a student is going to register for his/her courses in the 3rd year 2nd term, his/her earned credits up to 2nd year 2nd term must be at least 36. Otherwise, his/her studentship at the University will stand canceled.

Approval Records	
Approving Authority	Date of Approval
Curriculum Committee of the Discipline	
Executive Committee of the School	
BOAS (if applicable)	
Academic Council	
Syndicate (if applicable)	

Concerned Committee* of the Discipline/POE			
Serial No.	**Name and Address**	**Designation in Committee**	**Remarks**
1	Dr. Md. Nabiul Islam Khan, Professor, Forestry and Wood Technology Discipline	Chairman	
2	Dr. Md. Wasiul Islam, Professor, Forestry and Wood Technology Discipline	Member	
3	Dr. Md. Ashaduzzaman, Professor, Forestry and Wood Technology Discipline	Member	
4	S.M. Rubaiot Abdullah, Associate Professor, Forestry and Wood Technology Discipline	Member	
5	Dr. Arun K. Bose, Assistant Professor, Forestry and Wood Technology Discipline.	Member	

*Bachelor of Science (Honours) in Forestry

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Summary of Major Changes in the OBE Format Curriculum

Program : Bachelor of Science (Honours) in Forestry

Discipline **:** Forestry and Wood Technology Discipline

School **:** Life Science School

Sl. No.	Criteria	Existing Curriculum	OBE Curriculum
1	Duration of the Program (in Year)	4	4
2	Total Available Credits	204	196
3	Minimum Credit Requirement to Complete the Degree	160	160
4	Available Credits from GED Courses	-	51
5	Credits from GED Courses (% of Total Credits)	-	26%
6	Credits from GED Courses (% of Required Credits)	-	32%
7	Available Credits from Core Theory Courses*	102	104
8	Available Credits from Core Sessional Courses*	37	36
9	Available Credits from Optional Theory Courses*	48	40
10	Available Credits from Optional Sessional Courses*	17	16
11	Available Credits from Capstone Courses	-	5
12	Term Duration (in week)	19	20
13	Credits from Newly Introduced Courses	-	4
14	Number of Newly Introduced Courses	-	3
15	Number of Omitted Courses	-	3
16	Change in Course Title (Number of Courses)	-	1
17	Change in Course Status (Number of Courses)	-	2
18	Inter-term Shift (Number of Courses)	-	2
19	Change in Course Contents (Number of Courses)	-	94
20	Name of Majors (if Applicable)		
21	Name of Modes (if applicable)	-	

* including GED

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