UG PROGRAM

(4 Years Honors)CBCS-2020-21

B.Sc
FORESTRY

Syllabus and Model Question Papers

Skill Enhancement Courses (SECs) for Semester -V,

From 2022-23(Syllabus-Curriculum)
Structure of SECs for Semester–V

(To choose One pair from the Four alternate pairs of SECs)

Univ. Code	Course NO. 6&7	Name of Course	Th. Hrs. / Week	IE Mar-ks	EE Mar-ks	Credits	Prac. Hrs./ Week	Mar-ks	Credits
	6A	**Forest Survey and Engineering**	**4**	**25**	**75**	**4**	**2**	**50**	**1**
	7A	**Forest Mensuration**	**4**	**25**	**75**	**4**	**2**	**50**	**1**
		OR							
	6B	**Forest Management**	**4**	**25**	**75**	**4**	**2**	**50**	**1**
	7B	**Plantation Forestry**	**4**	**25**	**75**	**4**	**2**	**50**	**1**
		OR							
	6C	**Forest Products and their Utilization**	**4**	**25**	**75**	**4**	**2**	**50**	**1**
	7C	**Agro-forestry**	**4**	**25**	**75**	**4**	**2**	**50**	**1**

Note:*Course type code:T: Theory, L: Lab,P: Problem solving

Note 1: For Semester–V, for the domain subject **FORESTRY**, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note 2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Note 3: To insert assessment methodology for Internship/ on the Job Training/Apprenticeship under the revised CBCS as per APSCHE Guidelines.

- First internship (After 1st Year Examinations): Community Service Project. To¬ inculcate social responsibility and compassionate commitment among the students, the summer vacation in the intervening 1st and 2nd years of study shall be for Community Service Project (the detailed guidelines are enclosed).
  Credit For Course: 04

- Second Internship (After 2nd Year Examinations): Apprenticeship / Internship /¬ on the job training / In-house Project / Off-site Project. To make the students employable, this shall be

undertaken by the students in the intervening summer vacation between the 2nd and 3rd years (the detailed guidelines are enclosed).
Credit For Course: 04

Third internship/Project work (6th Semester Period):¬ During the entire 6th Semester, the student shall undergo Apprenticeship / Internship / On the Job Training. This is to ensure that the students develop hands on technical skills which will be of great help in facing the world of work (the detailed guidelines are enclosed).
Credit For Course:12

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:4
Course:6A	**Forest Survey and Engineering**	Hrs/Wk:4

Learning Outcomes:

Students at the successful completion of the course will be able to:

1. Acquire a critical knowledge of basics of forest surveying.
2. Explain methods of forest surveying.
3. Acquire skills on using plane tables in forest surveying.
4. Perform managerial skills related to construction of buildings in forests.
5. Demonstrate skills of planning and executing roads and bridges in forests.

Syllabus: (Hours: Teaching: 50, Lab: 30, Training: 05, Others incl. unit tests: 05)
(*Syllabi of theory and practical together shall be completed in 80 hours*)

Unit -1: Basics of Forest survey (10h)

1. Forest survey, scope and types of surveying, chain surveying, types and instruments used.
2. Traversing, triangulation, survey stations, base line, check and tie lines; ranging of survey lines.
3. Offsets and their types; chain of sloppy grounds, chaining across obstacles; cross staff surveying.

Unit -2: Methods of surveying (10h)

1. Areas of irregularly bounded fields- different methods; Simpson's, trapezoidal rule.
2. Compass surveying, chain and compass traversing.
3. Magnetic and true bearing, prismatic compass, local attraction.

Unit-3: Plane tables (10h)

1. Computation of interior angles and balancing of closed traverse.
2. Plane table surveying; plane table and its accessories, methods of plane table surveying.
3. Leveling: terms used types of level. Dumpy levels and its adjustments, booking the staff readings, calculation of reduced levels.

Unit-4: Buildings in forests (10h)

1. Contour surveying. Buildings materials- types, strength and characteristics, site selection for building construction.
2. Design of check dams. Concepts of green buildings.

Unit-5:Roads and bridges in forests (10h)

1. Forest roads alignment, construction and drainage.
2. Retaining walls, breast wall, water ways and culverts.
3. Bridges-types, selection of site, simple wooden beam bridge, spurs.

References:

1. Kanetkar, T.P. and Kuakarni, S.V. (1989). Surveying and levelling. Vidyarthi Griha Prkashan, Pune.
2. Masani, N.J. (2006). Forest Engineering -without tears (2nd edition). Natraj Publishers, Dehra Dun.
3. Parkash, R. (1983). Forest Surveying, International Book Distributor, Dehradun
4. Negi, S.S. (1997). Hand Book of Forest Engineering, International Book Distributor, Dehradun.

Co-Curricular Activities (student field training by teacher: 05 hours**):**

a) Mandatory:

1. **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for a total of not less than 10 hours on forest surveying, methodologies, using plane tables, design of buildings and check dams; planning and executing roads and bridges.
2. **For Student**: Individual laboratory work and visit to forests in native district and also other districts of Andhra Pradesh, studying the survey methods, equipment/instruments used; construction of check dams; layout of buildings, roads and bridges; culminating writing and submission of a hand-written Field Work Report (various survey methods in forest surveying, check dams, buildings, roads, bridges etc.,) not exceeding 10 pages in the given method or format.
3. Max marks for Field Work Report: 05
4. Suggested Format for Field work Report *(not exceeding 10 pages*): Title page with student details, index page, objective, stepwise work done, findings, conclusions and acknowledgements.
5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Training of students by experts in forest surveying.
2. Assignments (including technical assignments like methods of surveying, equipment used, construction of check dams, buildings and bridges in forests)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on forest surveying methods, construction of check dams, buildings and bridges in forests.
5. Collection of material/figures/photos related to forest surveying in India and abroad, writing and organizing them in a systematic way in a file.
6. Visits to different types of forests in A.P. and India.
7. Invited lectures and presentations on related topics by forest department personnel.

MODEL QUESTION PAPER

B.Sc. DEGREEEXAMINATION

Semester-V

Course6A: Forest Survey and Engineering

Max. Time: 3Hrs. **Max.Marks:75**

SECTION – A

Answer any FIVE questions. **5x5=25M**

1. Chain surveying
2. Cross surveying
3. Compass traversing
4. Prismatic compass
5. Plane table surveying
6. Characteristics of building materials
7. Green buildings
8. Spurs

SECTION – B

Answer ALL the questions. **5x10=50M**

9. (a)Explain scope and types of forest surveying.

(OR)

(b)Define offsets. Discuss about different types of offsets.

10. (a)Describe different methods used in surveying of areas of irregularly bound fields.

(OR)

(b)Write notes on (i) Magnetic bearing (ii) Local attraction

11. (a)Explain about computation of interior angles and balancing of closed traverse.

(OR)

(b)What is a plane table? Explain methods of plane table surveying.

12. (a) Discuss about types of building materials. Add a note on site selection for building.

(OR)

(b)Discuss the design of check dams with the help of a diagram.

13. (a)Write an essay on forest roads alignment and construction.

(OR)

(b)Describe different types of bridges. Add a note of simple wooden bridge.

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:1
Course:6A	**Forest Survey and Engineering Lab**	Hrs/Wk:2

Learning Outcomes:

On successful completion of this practical course, student will be able to:

1. Acquire skills on various methods of forest surveying.
2. Perform various skills related to using plane tables.
3. Acquaint with making plans for different physical structures in forests.
4. Demonstrate skills in construction of buildings, roads, dams and bridges in forests.

Practical (Laboratory) Syllabus: (30 hrs)

1. Chain surveying, compass traversing.
2. Plane table surveying, leveling, calculations of earth work for construction of forest.
3. Roads and earth dams; alignment of forest roads.
4. Preparation building plans.
5. Design of water ways
6. Design of simple wooden beam bridge; design of retaining walls.
7. Design of check dams.

Model Question Paper Pattern for Practical Examination

Semester – V/ Forestry Skill Enhancement Course

Forest Survey and Engineering

Max. Time: 3 Hrs. Max. Marks: 50

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1. Demonstration of a forest survey method 'A' 8
2. Demonstration of using plane tables in forest surveying/preparation of building plans 'B' 10
3. Designing water ways/bridges/check dams'C' 12
4. Scientific observation and data analysis 4 x 3 = 12
   D. An instrument used
   E. Building material
   F. Check dams/ Green buildings
   G. Walls/Bridges
5. Record + Viva-voce 5+3 = 8

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:4
Course:7A	**Forest Mensuration**	Hrs/Wk:4

Learning Outcomes:

Students at the successful completion of the course will be able to:

1. Explain basic concepts in forest mensuration.
2. Make measurements of bark, crown and height of forest trees.
3. Determine biomass and age of forest trees..
4. Acquire skills on making measurements related to tree crops.
5. Performskills related to different sampling methods in forest mensuration.

Syllabus: (Hours: Teaching: 50, Lab: 30, Training: 05, Others incl. unit tests: 05)

(*Syllabi oftheory and practical together shall be completed in 80 hours*)

Unit -1: Concepts of forest mensuration (10h)

1. Forest Mensuration- Definition, objectives and scope of forest mensuration. Scales and units of measurement, error and accuracy.
2. Measurement of individual tree parameters - tree diameter and girth - objectives, standard rules governing measurement at breast height and instruments used.
3. Upper stem diameter measurement- Objective and instruments used.

Unit -2: Organ measurements (10h)

1. Bark measurements objectives, bark thickness, bark surface area and bark volume.
2. Crown measurement - objectives, crown diameter, crown height, crown surface area and crown volume.
3. Height measurement – direct and indirect methods. Height measurement principles- geometric and trigonometric principles, height measuring instruments, error in height measurement and height measurement of leaning tree.

Unit-3: Growth measurements (10h)

1. Trees stem form- theories, classification of form factors and form quotient. Volume tables definition, classification and preparation.
2. Tree biomass- objective and biomass estimation methods.
3. Age determination of tree- objective and methods.
4. Tree growth measurement – objectives, increment, and determination of increment, stump analysis, stem analysis and increment boring.

Unit-4: Measurements in tree crops (10h)

1. Measurement of tree crops – objectives, crop diameter, crop height, crop age and crop volume.
2. Stand growth, site quality, site index, stand structure, yield tables, preparation and stand table.
3. Forest inventory – definition, objectives, kinds of enumeration.

Unit-5: Sampling methods (10h)

1. Sampling- definition, advantages, kinds of sampling, random sampling: (simple, stratified, multistage and multiphase sampling).
2. Non-random sampling (selective, systematic and sequential sampling) sampling design, size and shape of the sampling units.
3. Point sampling- horizontal and vertical point sampling.

References:

1. Chaturvedi, A.N and L.S. Khanna. (2011). Forest Mensuration and Biometry (5th edition). Khanna Bandhu. Dehra Dun.364 pp.
2. Husch, B., Beers, T.W. and Kershaw,Jr. J.A. (2002). Forest Mensuration (4th edition). John Wiley & Sons, Nature.456 pp.
3. Laar, V. A. and Akca, A. (2007). Forest Mensuration. Managing Forest Ecosystems (Vol.13). Springer.384pp.
4. West, P.W. (2009). Tree and Forest Measurement (2nd edition). Springer. 192pp.
5. Agarwal, P. (2008). Forest Mensuration- Tree measurement. Bishen Singh Mahendra Pal Singh Publishers & Distributors of Scientific Books, 220pp.

Co-Curricular Activities (student field training by teacher: 05 hours**):**

c) Mandatory:

1. **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for a total of not less than 10 hours on forest mensuration methodologies, measurements in relation to various organs of forest trees, determination of stem form, biomass and age of trees; planning and executing sampling methods.
2. **For Student**: Individual laboratory work and visit to forests in native district and also other districts of Andhra Pradesh, studying various methods in forest mensuration, equipment/instruments used; collecting data on different measurements related trees in forests; application of apt sampling method;culminating writing and submission of a hand-written Field Work Report (various methods in forest mensuration, tree stem forms, crown, biomass, age etc.,) not exceeding 10 pages in the given method or format.
3. Max marks for Field Work Report: 05
4. Suggested Format for Field work Report *(not exceeding 10 pages*): Title page with student details, index page, objective, stepwise work done, findings, conclusions and acknowledgements.
5. Unit tests (IE).

d) Suggested Co-Curricular Activities:

1. Training of students by experts in forest mensuration.
2. Assignments (including technical assignments like methods in forest mensuration, equipment used, determination of height, biomass and age of trees; sampling methods)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on forest mensuration methods, determination of height, biomass and age of trees, sampling methods.
5. Collection of material/figures/photos related to forest mensuration in India and abroad, writing and organizing them in a systematic way in a file.
6. Visits toforest college/research institute in India.
7. Invited lectures and presentations on related topics by forest department personnel.

MODEL QUESTION PAPER

B.Sc DEGREE EXAMINATION

Semester-V

Course7A: Forest Mensuration

Max. Time: 3Hrs. **Max.Marks:75**

SECTION – A

Answer any FIVE questions. **5x5=25M**

1. Objectives and scope of forest mensuration
2. Measuring crown volume
3. Height measurement of leaning tree
4. Determination of increment of tree growth
5. Objectives of forest inventory
6. Tree crop volume measurement
7. Vertical point sampling
8. Bark volume measurement

SECTION – B

Answer ALL the questions. **5x10=50M**

9. (a)Explain how tree diameter and girth are measured?

(OR)

(b)Discuss about the objective and instruments used in upper stem diameter measurement.

10. (a)Write an essay on measurement of crown diameter, crown height and crown surface area.

(OR)

(b)Describe the direct and indirect methods to measure the height of trees.

11. (a)Discuss the objectives and methods to estimate tree biomass.

(OR)

(b)Write an essay on various parameters related to tree growth measurements.

12. (a) Explain how diameter, height and age of tree crop are measured?

(OR)

(b)Discuss about the stand structure, yield tables, preparation and stand table.

13. (a)Define sampling. Discuss about the advantages and kinds of sampling.

(OR)

(b)Write an essay on non-random sampling.

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:1
Course:7A	**Forest Mensuration Lab**	Hrs/Wk:2

Learning Outcomes:

On successful completion of this practical course, student will be able to:

1. Handle instruments used in forest mensuration.
2. Perform skills related to measurements of different organs in trees.
3. Demonstrate skills in determination of height, biomass and age of trees.
4. Acquaint with sampling methods.

Practical (Laboratory) Syllabus: (30 hrs)

1. Units of measurement and uses in forestry. Measurements of diameter, girth and upper stem diameter of trees using Calipers, Tape, Ruler, Penta Prism, Criterion Dendrometer etc.
2. Measurement of bark thickness, bark volume, bark area.
3. Measurement of crown diameter, crown area and crown volume.
4. Measurement of tree height using instrumental methods- Abney's level, Ravi Altimeter, Spiegel Relaskop, Clinometer etc. Estimation of form factor.
5. Volume estimation of logs, felled trees and standing trees. Preparation of local volume table.
6. Determination of age of standing trees by increment boring method.
7. Study on stump analysis.
8. Calculation of CAI and MAI.
9. Sampling exercises including point sampling.

Model Question Paper Pattern for Practical Examination

Semester – V/ Forestry Skill Enhancement Course

Forest Mensuration

Max. Time: 3 Hrs. Max. Marks: 50

1. Demonstration of a handling equipment used in forest mensuration 'A' 8
2. Determination of crown diameter, area and volume of a tree 'B' 10
3. Determination of height/biomass/age of a tree 'C' 12
4. Scientific observation and data analysis 4 x 3 = 12
   - D. An instrument used
   - E. Crown type
   - F. Forest crop plant
   - G. Sampling method
5. Record + Viva-voce 5+3 = 8

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:4
Course:6B	**Forest Management**	Hrs/Wk:4

Learning Outcomes:

Students at the successful completion of the course will be able to:

1. Acquire a critical knowledge of forest management.
2. Explain methods for sustainable management.
3. Estimate growth and yield from a forest.
4. Perform managerial skills in planning and executing forests.
5. Demonstrate skills on modern tools in forest management.

Syllabus: (Hours: Teaching: 50, Lab: 30, Training: 05, Others incl. unit tests: 05)
(*Syllabi of theory and practical together shall be completed in 80 hours*)

Unit -1: Basics of Forest management (10h)

1. Definition, Scope, Objective and Principles of Forest Management.
2. Organization of state forests. Sustained yield-definition, Principles and limitations increasing and progressive yields.

Unit -2: Sustainable forest management (10h)

1. Sustainable Forest Management-Criteria and Indicators.
2. Rotation-definitions-various types of Rotations-length of rotations, choice of type and kind of rotation.
3. Normal forest-definitions, basic factors of normality.

Unit-3: Growth and yield (10h)

1. Growing stock, Estimation of growing stock. Yield regulation- concept, basis and yield regulation models.
2. Estimation of growth and yield prediction in forest stands- Stand structure - Stand density.

Unit-4: Planning (10h)

1. Working plan-Working Plan Code 2014- preparations objectives and uses.
2. Forest maps and their uses. Joint forest management.

Unit-5:Modern tools (10h)

1. Modern tools in forest management.
2. Concept and Importance of Ecotourism, Ecotourism in Indian perspectives.

References:

1. Balakathiresan, S (1986). Essentials of Forest Management, Nataraj Publishers, Dehradun.
2. Bhattacharya P., Kandya A.K. and Krishna Kumar (2008). Joint Forest Management in India, Aavishkar Publisher, Jaipur.
3. Desai, V. (1991). Forest Management in India –Issues and Problems. Himalaya Pub. House, Bombay.
4. Edmunds, D and Wollenberg, E (2003). Essentials of Forest Management, Natraj Publishers, Dehra Dun.

Co-Curricular Activities (student field training by teacher: 05 hours**):**

e) Mandatory:

6. **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for a total of not less than 10 hours on concepts of forest management, measures for sustainability, estimation of growth and yield, planning and using modern tools.
7. **For Student**: Individual laboratory work and visit to forests in native district and also other districts of Andhra Pradesh, studying various components, growth and yield, planning, opportunities for eco-tourism etc.; culminating writing and submission of a hand-written Field Work Report (various methods in forest components, sustainability, growth and yield, ecotourism etc.,) not exceeding 10 pages in the given method or format.
8. Max marks for Field Work Report: 05
9. Suggested Format for Field work Report *(not exceeding 10 pages*): Title page with student details, index page, objective, stepwise work done, findings, conclusions and acknowledgements.
10. Unit tests (IE).

f) Suggested Co-Curricular Activities:

1. Training of students by experts in forest management.
2. Assignments (including technical assignments like various forests, components, growth and yield, utilization, sustainability, planning and execution, eco-tourism etc.,)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on forest management, growth and yield, products and utilization, ecotourism.
5. Collection of material/figures/photos related to forest management in India and abroad, writing and organizing them in a systematic way in a file.
6. Visits tovarious forests and forest training college/research institute in India.
7. Invited lectures and presentations on related topics by experts in forest management.

MODEL QUESTION PAPER

B.Sc. DEGREEEXAMINATION

Semester-V

Course6B: Forest Management

Max. Time: 3Hrs. **Max.Marks:75**

SECTION – A

Answer any FIVE questions. **5x5=25M**

1. Scope and objectives of forest management
2. Normal forest
3. Stand density
4. Objectives and uses of working plan
5. Importance of ecotourism
6. Criteria for sustainable forest management
7. Kinds of rotation
8. Joint forest management

SECTION – B

Answer ALL the questions. **5x10=50M**

9. (a)Explain principles of Forest Management.

(OR)

(b)Discuss the principles and limitations in achieving sustainability.

10. (a)Define rotation. Explain about different types of rotations.

(OR)

(b) Describe different aspects in rotation.

11. (a)Define growing stock. Describe different parameters of growing stock.

(OR)

(b)Explain about estimation of growth and yield prediction in forest stands.

12. (a) Explain objectives and preparation sin relation to working Plan Code-2014.

(OR)

(b) Discuss about the forest maps and their uses.

13. (a)Write an essay on modern tools in forest management.

(OR)

(b) Write an essay on ecotourism in Indian perspectives.

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:1
Course:6B	**Forest Management Lab**	Hrs/Wk:2

Learning Outcomes:

On successful completion of this practical course, student will be able to:

1. Explain the principles in forest management.
2. Perform skills related to managing sustainability.
3. Estimate growth and yield of a forest.
4. Acquaint with ecotourism opportunities.

Practical (Laboratory) Syllabus: (30 hrs)

1. Visit to different forest divisions to study the various stand management aspects including thinning, felling and sale of timber.
2. Study forest organizational set up and forest range administration including booking of offences.
3. Visit to forest plantation- Field exercise for the estimation of actual growing stock volume.
4. Study the different field exercises for data collection for working plan.
5. Acquaintance with Forest Code, Forest maps and plantation journals.

Model Question Paper Pattern for Practical Examination

Semester – V/ Forestry Skill Enhancement Course

Forest Management

Max. Time: 3 Hrs. Max. Marks: 50

1. A study report on management practices in a state forest office 'A' 8
2. Design and execution of management practices in a forest 'B' 10
3. Determination of growth and yield of a forest'C' 12
4. Scientific observation and data analysis 4 x 3 = 12
   - D. Forest type
   - E. Stock volums
   - F. Forest map
   - G. Plantation
5. Record + Viva-voce 5+3 = 8

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:4
Course:7B	**Plantation Forestry**	Hrs/Wk:4

Learning Outcomes:

Students at the successful completion of the course will be able to:

1. Acquire a critical knowledge of plantation forestry.
2. Make a plan and execute plantation forestry.
3. Acquire skills on management of plantations.
4. Demonstrate skills of studying the dynamics in plantation forestry.
5. Perform managerial skills related to industrial and clonal plantations.

Syllabus: (Hours: Teaching: 50, Lab: 30, Training: 05, Others incl. unit tests: 05)
(*Syllabi of theory and practical together shall be completed in 80 hours*)

Unit -1:Basics of plantation forestry (10h)

1. Plantations-definition and scope- History of plantations- Development of plantation forestry, present status in national and international scenario.
2. Plantation organization and structure, plantation characteristics-species composition-age class distribution- stocking.
3. Land and plantation development – National land use policy- land use for forestry.
4. Social and economic factors in plantation development finance- economics of plantation development- land availability-labour-infrastructure, economic, marketing, social and cultural effects.

Unit -2: Planning of plantation (10h)

1. Plantation planning-National and regional planning-project appraisal and project implementation– feasibility studies.
2. Plantation silvi culture - Choice of species-concept of fast growth-exotics vs. indigenous- traditional vs. intensive forest management.
3. Plantation establishment-essentials- ground preparation- planting- planting stock- planting pattern- spacing.
4. General planting rules-protection and after care of newly planted seedlings.

Unit-3: Maintenance of plantation (10h)

1. Plantation maintenance- death of seedling-weed control –cleaning, singling, pruning.
2. Nutrition in plantations- nutrient deficiencies, symptoms of deficiency- use of fertilizers.
3. Major pest and disease in plantations- sanitation and control measures.

Unit-4: Dynamics in plantations (10h)

1. Dynamics of stand growth- stand density management in plantations- spacing-planting density regulation- thinning regimes improvement fellings- CCF-MCA.
2. Site quality evaluation- stand basal area-site index concept in plantation forestry- plantation productivity assessment- growing stock assessment MAI of different plantations.
3. Modern concepts in plantation forestry.

Unit-5: Industrial and clonal plantations (10h)

1. Industrial plantation- paper and pulp wood- Match wood plantation- plywood plantation Plantations yielding NTFPs.
2. Clonal plantations- development and management of clonal plantation- Plantations as potential carbon sinks- C-sequestration, C-substitution and C-conservation functions; LULUCF and REDD concepts, AR-CDM concepts.

References:

1. Evans, J. 1992. Plantation Forestry in the Tropics, 2nd edition. Oxford, UK, Clarendon Press.
2. Bowen, G.D., E. K. S. Nambiar, E.K.S 1984. Nutrition on Plantation Forests. Academic Press, 1984 - Nature – 516 pages
3. Suzuki, K., Ishii, K., Sakurai, S. and Sasaki, S. 2006. Plantation Forestry in the Tropics. Springer Tokyo.
4. Nambiar, E.K.S., Cossalter, C and Tiarks.A. 1998. Site Management and Productivity in Tropical Plantation Forests. Workshop Proceedings, South Africa.

Co-Curricular Activities (student field training by teacher: 05 hours**):**

g) Mandatory:

1. **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for a total of not less than 10 hours on concepts of forest plantation process, choice of species, management practices etc.
2. **For Student**: Individual laboratory work and visit to village forests in native district and also other districts of Andhra Pradesh, studying species grown, planning, various management practices; culminating writing and submission of a hand-written Field Work Report (species, pests and diseases, cultivation practices, management etc.,) not exceeding 10 pages in the given method or format.
3. Max marks for Field Work Report: 05
4. Suggested Format for Field work Report *(not exceeding 10 pages*): Title page with student details, index page, objective, stepwise work done, findings, conclusions and acknowledgements.
5. Unit tests (IE).

h) Suggested Co-Curricular Activities:

1. Training of students by experts in forest management.
2. Assignments (including technical assignments like village forest plantations, species, pests and diseases, management etc.,)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on village forest plantations and their management.
5. Collection of material/figures/photos related to forest plantations in India and abroad, writing and organizing them in a systematic way in a file.
6. Visits toplantation forests in nearby places.
7. Invited lectures and presentations on related topics by experts in forest plantation programmes.

MODEL QUESTION PAPER
B.Sc.DEGREEEXAMINATION
Semester-V
Course7B: Plantation Forestry

Max. Time: 3Hrs. **Max.Marks:75**

SECTION – A

Answer any FIVE questions. **5x5=25M**

1. History of forest plantations
2. plantation characteristics
3. Traditional forest management
4. Sanitation and control measures in plantation forestry
5. LULUCF
6. C-sequestration
7. Site quality evaluation
8. Cultural effects on plantation forestry

SECTION – B

Answer ALL the questions. **5x10=50M**

9. (a)Explain development of plantation forestry. Add a note on present status in national and international scenario.

   (OR)

   (b)Discuss about national land use policy and land use for forestry.

10. (a)Explain about different aspects of plantation silviculture.

    (OR)

    (b) Describe about general planting rules, protection and after care of newly planted seedlings.

11. (a)Explain deficiency of different nutrients and associated symptoms in plantation forestry.

    (OR)

    (b)Discuss about major pest and disease in plantations.

12. (a) Explain about spacing, planting density regulation, thinning regimes improvement and fellings.

    (OR)

    (b) Discuss about modern concepts in plantation forestry.

13. (a) Write notes on (i) Match wood plantation and (ii) Plywood plantation

    (OR)

    (b) Write an essay on development and management of clonal plantation

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:1
Course:7B	**Plantation Forestry Lab**	Hrs/Wk:2

Learning Outcomes:

On successful completion of this practical course, student will be able to:

1. Handle tools and materials for plantation forestry.
2. Perform skills related to various planting operations.
3. Acquire knowledge on plantations by government and private agencies.
4. Evaluate the economic inputs for plantations.

Practical (Laboratory) Syllabus: (30 hrs)

1. Study the tools and materials for plantation establishment- Visit small and large plantation.
2. Study their management and functioning- Exposure to plantation project preparation- economic evaluation and feasibility studies of plantation projects.
3. Study of planting operations- study of tending techniques, planting methods and techniques for different types of plantations including energy plantations, canal bank plantations.
4. Pulp wood plantations- study of APFDC plantations, road side plantations plantation planning.
5. Plantation journal- Choice of species for plantations.
6. Economic considerations in plantation
7. Study of Govt. vs. Pvt. plantations.

Model Question Paper Pattern for Practical Examination

Semester – V/ Forestry Skill Enhancement Course

Plantation Forestry

Max. Time: 3 Hrs. Max. Marks: 50

1. Designing and developing a plantation crop model 'A' 8
2. Identifying nutrition deficiencies in plantation crops 'B' 10
3. Identification of a pest/disease in plantation crops'C' 12
4. Scientific observation and data analysis 4 x 3 = 12
   - D. A plantation species
   - E. Nutrition deficiency symptom
   - F. Pest
   - G. Disease
5. Record + Viva-voce 5+3 = 8

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:4
Course:6C	**Forest Products and their Utilization**	Hrs/Wk:4

Learning Outcomes:

Students at the successful completion of the course will be able to:

1. Acquire a critical knowledge of wood logging and extraction.
2. Explain the processes related to paper making.
3. Explain the processing of wood and uses of wood products.
4. Explain the positive and negative interactions of tree crop species.
5. Demonstrate skills of utilizing different forest products.

Syllabus: (Hours: Teaching: 50, Lab: 30, Training: 05, Others incl. unit tests: 05)
(*Syllabi of theory and practical together shall be completed in 80 hours*)

Unit -1: Wood products (10h)

1. Logging and Extraction Techniques; Transport and storage, physical and mechanical properties of wood, defects and abnormalities.
2. Composite and other wood products, saw milling, wood seasoning and preserving.

Unit -2: Paper industry (10h)

1. Pulp and paper industry. Introduction and raw material; pulping-mechanical, chemical, semi-chemical and semi-mechanical.
2. Pulp bleaching; stock preparation and sheet formation.
3. Types of paper; manufacture of rayon and other cellulose derived products.

Unit-3: Other wood products (10h)

. 1. Manufacture, properties and uses of Composite wood- plywood, fiber board, particle board and hard board.

2. Adhesives used in manufacture of composite wood. Improved wood-definition, types (impregnated wood, heat stabilized wood, compressed wood, and chemically modified wood esp. acetylation of wood).

Unit-4: Uses of wood (10h)

1. Destructive distillation of wood. Saccharification of wood. Production of wood molasses, alcohol and yeast.
2. Uses of wood. Structural uses of Timber. Decorative uses of wood. Wood carving and handicrafts.

Unit-5: Other forest based products (10h)

1. Nano technology in wood. Biochar. Short rotation forestry crops.
2. Other forest based industries – veneer, sawn wood, furniture, bamboo, sports goods, pencil making, match box and splint making.

References:

1. Mehta, T. (1981). A Handbook of Forest Utilization, Periodical Expert Book Agency.
2. FRI [Forest Research Institute]. 1976. Indian forest utilization. Volume I and II. Forest Research Institute and colleges, Dehradun. 941p.
3. Hoadley, B. 2000. Understanding Wood: A Craftsman's guide to wood technology. Taunton Press. Newtown, USA. 223p.
4. Baldwin, R. F. 1981. Plywood manufacturing practices. Revised 2nd Ed. Miller and Freeman Publication, Inc. USA. 388p.

Co-Curricular Activities (student field training by teacher: 05 hours**):**

i) Mandatory:

1. **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for a total of not less than 10 hours on wood, paper industry, wood products etc.,
2. **For Student**: Individual laboratory work and visit to forests and silviculture plantations in native district and also other districts of Andhra Pradesh, studying wood logging, wood based products, different uses of woods; culminating writing and submission of a hand-written Field Work Report (various woods, paper products, other wood products etc.,) not exceeding 10 pages in the given method or format.
3. Max marks for Field Work Report: 05
4. Suggested Format for Field work Report *(not exceeding 10 pages*): Title page with student details, index page, objective, stepwise work done, findings, conclusions and acknowledgements.
5. Unit tests (IE).

j) Suggested Co-Curricular Activities:

1. Training of students by experts in forest mensuration.
2. Assignments (including technical assignments like wood collection, logging, paper products, other wood products)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on wood collection, processing, paper products, other wood products and their uses.
5. Collection of material/figures/photos related to forest products in India and abroad, writing and organizing them in a systematic way in a file.
6. Visits tosilviculture plantations, saw mills, paper industries etc.
7. Invited lectures and presentations on related topics by forest department / industry personnel.

MODEL QUESTION PAPER

B.Sc. DEGREE EXAMINATION

Semester-V

Course6C:Forest Products and their Utilization

Max. Time: 3Hrs. **Max.Marks:75**

SECTION – A

Answer any FIVE questions. **5x5=25M**

1. Transport of wood
2. Wood logging
3. Pulp bleaching
4. Manufacture of ryon
5. Acylation of wood
6. Destructive distillation of wood
7. Decorative uses of wood
8. Match box making

SECTION – B

Answer ALL the questions. **5x10=50M**

9. (a)Explain the physical and mechanical properties of wood. Add a note on defects and abnormalities.

(OR)

(b)Discuss about composite and other wood products.

10. (a)Write an essay on different methods of pulp making.

(OR)

(b)Discuss about different types of papers.

11. (a)Define improved wood. Discuss about any four types of improved woods.

(OR)

(b)Write an essay on manufacture, properties and uses of composite wood.

12. (a) Explain about (i) Structural uses of Timber (ii) Wood carving and handicrafts

(OR)

(b)Discuss about the production of wood molasses, alcohol and yeast.

13. (a)Discuss about (i) Biochar and (ii) Short rotation of forestry crops.

(OR)

(b)Write notes on (i) Bamboo and (ii) Pencil making.

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:1
Course:6C	**Forest Products and their Utilization Lab**	Hrs/Wk:2

Learning Outcomes:

On successful completion of this practical course, student will be able to:

1. Perform skills on paper making.
2. Identify different papers and paper boards.
3. Discriminate different wood products.
4. Acquaint with wood processing.

Practical (Laboratory) Syllabus: (30 hrs)

1. Study pulp and paper making.
2. Study and collection of different types of papers.
3. Study of different types of paper boards.
4. Study of plywood, fiber boards, particle boards, and hard boards.
5. Study of types of improved wood.
6. Study veneering and different kinds of sawing.

Model Question Paper Pattern for Practical Examination

Semester – V/ Forestry Skill Enhancement Course

Forest Products and their Utilization

Max. Time: 3 Hrs. Max. Marks: 50

1. Demonstration of pulp and paper making 'A' 8
2. Demonstration of veneering and sawing 'B' 10
3. Collection and submission of a report on forest woods and products'C' 12
4. Scientific observation and data analysis 4 x 3 = 12
   D. Timber yielding plant
   E. Wood
   F. Paper/paper boards
   G. Improved wood
5. Record + Viva-voce 5+3 = 8

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:4
Course:7C	Agro-forestry	Hrs/Wk:4

Learning Outcomes:

Students at the successful completion of the course will be able to:

1. Acquire a critical knowledge of agroforestry and its significance.
2. Explain different systems of agroforestry.
3. Acquire skills related to selection of land and plant species for agroforestry.
4. Explain the positive and negative interactions of tree crop species.
5. Demonstrate skills of designing and developing an agroforestry.

Syllabus: (Hours: Teaching: 50, Lab: 30, Training: 05, Others incl. unit tests: 05)
(*Syllabi oftheory and practical together shall be completed in 80 hours*)

Unit -1: Basic concepts of agroforestry (10h)

1. Over view of Indian agriculture- its structure and constraints. Concept of sustainable agriculture and land use management.
2. Agroforestry definition and scope, rising demands of fuel wood, fodder and timber.
3. History of agroforestry- social, ecological, and economic reasons for agroforestry.

Unit -2: Agroforestry systems (10h)

1. Classification of agroforestry system - structural, functional, socio-economic, and ecological basis.
2. Traditional agroforestry systems: shifting cultivation, taungya, homegardens.
3. Land use - definition, classification, and planning.

Unit-3: Species used in agroforestry (10h)

1. Land capability classification and land use – definition, classification, and planning.
2. Plantation agriculture and plantation forestry.
3. Choice of species for agroforestry - criteria for selection of fodder trees, fuel wood and charcoal trees, food and medicinal uses, pulp wood and round wood used; multipurpose trees, nitrogen fixing trees.

Unit-4: Tree crop interactions (10h)

1. Provisional and regulatory services of agroforestry- food and nutritional security.
2. Positive interactionsof tree cropsin agroforestry: Increased productivity, Soil improvement, nutrient cycling, microclimateamelioration-carbon sequestration.
3. Negative interactions: Competition, allelopathy.
4. Industrial agroforestry concept and importance.

Unit-5: Energy plantations (10h)

1. Plantation records- plantation journal- sustainability of plantations- fast growing plantations, myths and reality.
2. Energy plantation- high density short rotation plantations, petro-crops, energy from biomass. Strip plantation-road side plantation- canal side plantation- railway side plantation.

References:

1. Huxley, P. 1999. Tropical Agroforestry. Wiley: 384p.
2. Nair PKR, Rao MR, and Buck LE (eds), 2004. New Vistas in Agroforestry: A Compendium for the 1st World Congress of Agroforestry, Kluwer, Dordrecht, The Netherlands. Nair,
3. P.K.R. Agroforestry Systems in the Tropics. Springer. 680p.
4. Nair, P.K.R., Kumar, B.M. and Vimala D. N. 2009. Agroforestry as a strategy for carbon sequestration. J. Plant Nutr. Soil Sci. 172: 10–23.

Co-Curricular Activities (student field training by teacher: 05 hours**):**

k) Mandatory:

1. **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for a total of not less than 10 hours on systems in agroforestry, land utilization, selection of species etc.,
2. **For Student**: Individual laboratory work and visit to agro-forestry plantations in native district and also other districts of Andhra Pradesh, studying system, land use pattern, species grown, productivity; culminating writing and submission of a hand-written Field Work Report (various woods, paper products, other wood products etc.,) not exceeding 10 pages in the given method or format.
3. Max marks for Field Work Report: 05
4. Suggested Format for Field work Report *(not exceeding 10 pages*): Title page with student details, index page, objective, stepwise work done, findings, conclusions and acknowledgements.
5. Unit tests (IE).

l) Suggested Co-Curricular Activities:

1. Training of students by experts in agro-forestry.
2. Assignments (including technical assignments like rain fall, land use,species grown, products etc.,)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on agro-forestry systems, agronomy, products etc.,
5. Collection of material/figures/photos related to agro-forestry in India and abroad, writing and organizing them in a systematic way in a file.
6. Visits toagro-forestry plantations.
7. Invited lectures and presentations on related topics byexperts in the field concerned.

MODEL QUESTION PAPER

B.Sc. DEGREE EXAMINATION

Semester-V

Course7C: Agro-forestry

Max. Time: 3Hrs. **Max.Marks:75**

SECTION – A

Answer any FIVE questions. **5x5=25M**

1. Structure and constraints in Indian agriculture
2. Concept of sustainable agriculture
3. Classification of land use
4. Nitrogen fixing trees
5. Importance of industrial agro-forestry
6. Allelopathy
7. Road side plantation
8. Railway side plantation

SECTION – B

Answer ALL the questions. **5x10=50M**

9. (a)Discuss the scope and importance of agro-forestry.

   (OR)

   (b)Write an essay on social, ecological, and economic reasons for agroforestry.

10. (a)Discuss about the classification of agroforestry systems.

    (OR)

    (b)Explain about traditional agroforestry systems.

11. (a)Discuss about plantation agriculture and plantation forestry.

    (OR)

    (b) Write an essay on choice of species for in agroforestry and criteria for selection.

12. (a) Explain the positive interactions of tree crop species in agro-forestry.

    (OR)

    (b)Discuss about provisional and regulatory services of agroforestry.

13. (a)Discuss about (i) Plantation records and (ii) Fast growing plantations

    (OR)

    (b) Write notes on (i) High density short rotation plantations and (ii) Petro-crops

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits:1
Course:7C	**Agro-forestry Lab**	Hrs/Wk:2

Learning Outcomes:

On successful completion of this practical course, student will be able to:

1. Identify suitable conditions, land and species for agro-forestry.
2. Design and develop an agroforestry.
3. Demonstrate skills in getting products from agro-forestry.
4. Acquaint with cultivation of plants in a agro-forestry.

Practical (Laboratory) Syllabus: (30 hrs)

1. Study the components, arrangement and functioning of various forest and agro-ecosystems.
2. Collection of information on various tree and agricultural crops on their habitat, growth, tolerance to various climatic and edaphic factors and study their compatibility for integration.
3. Study land capability classification of various topographic regions.
4. Visit to problem sites such as wind prone, mined areas, degraded sites, flood prone areas etc. and design suitable land use strategies.

Model Question Paper Pattern for Practical Examination

Semester – V/ Forestry Skill Enhancement Course

Agro-forestry

Max. Time: 3 Hrs. Max. Marks: 50

1. Designing an agro-forestry 'A' 8
2. Demonstration of cultivation of plants in agro-forestry 'B' 10
3. Collection and submission of a herbarium of agro-forestry plants'C' 12
4. Scientific observation and data analysis 4 x 3 = 12
   - D. Land usage
   - E. Timber yielding plant
   - F. Fruit yielding plant
   - G. Pulp yielding plant
5. Record + Viva-voce 5+3 = 8