

Department of Higher Education, Govt. of M.P.

B.Sc. (SC & WM) Under Graduate Annual Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Session – 2017-18

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SOIL CONSERVATION AND WATER MANAGEMENT

B. Sc. I Year

Paper I- Soil Conservation and Water Management and Soil Science

**Unit – I**

History of Soil and Water Conservation in India. Soil erosion - Principle, processes and factor affecting. Land use patterns in different agro ecological regions, types of soil erosion and their control measures, impact assessment of soil erosion on productivity and land aggravation.

**Unit – II**

Soil and water conservation in research in India, Achievements and technology gaps, Water resources of India their distribution and quality parameters. Concept of watershed management – History and development in India. Special problems land slide, slips, Minespoils, torrents – their extent and distribution.

**Unit – III**

Soil definition, soil components, Soil Profile, Soil Physical Properties – Texture, structure bulk density, particle density, porosity, soil moisture, soil air, soil temperature, soil colour, soil consistency water holding capacity, clay minerals and their classification.

**Unit – IV**

Soil types of India their conservation problems and productivity potential's, Soil forming processes, rocks and minerals vis-a-vis Soil Properties of soil profiles and its developments soil classification (Soil Taxonomy), land capability classification, Types of soil survey, land use planning and its importance in soil conservation.

**Unit – V**

Cation exchange capacity and its importance for soil management, soil reaction – Soil pH its range in humid and arid regions in relation to management of soils. Saline, alkali and acid soils their identification and management, Biological characteristics – soil organism, micro-flora, micro-fauna – their relation for soil management, carbon cycle, nitrogen cycle, C/N ratio, Soil organic matter and its importance in soil conservation.

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B.Sc. I Year

**Paper II- WATER CONSERVATION ENGINEERING**

**Unit – I**

Role of soil and water conservation, Engineering in protecting natural resources. Need, types and Method of Engineering surveys. Method of measuring horizontal distances chaining and stadia method. Engineering measures for landslides, road side erosion and Minespoile control, contour cultivation, Compartment bunding, ridge-furrow system, broad bed - furrow and raised – Sunken bed system for water conservation and management.

**Unit – II**

Introduction of surveying equipments chains, tapes, compass levelling staff or rod etc. Levelling-terms, types and procedure. Compass survey. Types of bearings procedure and closing error, methods of plane table surveying, their advantages and limitations.

**Unit – III**

Rainfall measurement – Standard and Recording Type rain gauges, analysis of rainfall chart and Rainfall intensity, duration frequency relationship, factors affecting runoff and computation of peak rate by rational method.

**Unit – IV**

Design of water disposal structure-grassed water-ways, channels and diversions. Conservation ditches- their suitability, design criteria and economics. Types nomenclature, adaptability and limitations of erosion control structures on non- agriculture lands. Hydrological and structural design of control structure-Drop, Drop inlet and chute spillways.

**Unit – V**

Administrative and management division of forest, Silvi-cultural systems and their importance for soil and water conservation, High forest systems, clear felling system, selective system and coppies system, Natural and artificial regeneration of forest and their scope. Plant succession and its importance for soil and water conservation.

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**B. Sc. I year**

**Practical's**

1. Method of collection of soil samples from field for fertility evaluation.
2. To determine of pH in given soil sample.
3. To determine EC in given soil sample.
4. Study of engineering survey and Its type and work of surveyor.
5. To survey and prepare a map by chain and tap in given area.
6. To survey and prepare a map by radiation method of plan table survey in given area.
7. To survey and prepare a map by intersection method of plan table survey in given area.
8. To survey and prepare a map by prismatic compass instrument in given area.
9. To solve of horizontal distance between two points by chaining and stadia method in given area.
10. Measurement of height and dimension of trees by Abney's level.
11. Identification and botanical description of useful trees in soil and water conservation.

**Paper wise Marks Distribution**

S. No.	Subject	Paper	Paper Name	Maximum Marks
1.	SC&WM	I	Soil Conservation and Water Management and Soil Science	40
2.	SC&WM	II	Water Conservation Engineering	40
3.	SC&WM		Practical Exercise I-20 Marks; Exercise II-10 Marks; Viva-voice-10 Marks; Practical Record-10 Marks	50
4.	SC&WM		Internal Assessment (Quarterly & Half Yearly)	10+10

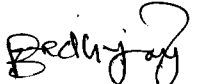
**Section wise Marks Distribution**

Maximum Marks – 40


S. No.	Section	Total Number of Questions	Marks
1.	A	Objective Type Questions 05 Questions of multiple choice	5×1 = 05
2.	B	Short Answer Type Questions 05 with internal choice ( one Question from each unit )	5×2 = 10
3.	C	Long Answer Type Questions 05 with internal choice ( one Question from each unit )	5×5 = 25

**Name of Committee members**


  
15/06/17  
Dr. S. K. Verma;

  
Dr. R. K. Upadhyay;

  
Dr. B. Sachidanand

  
Reval Singh Kharat;

  
Dr. U. R. Khandkar;

  
Dr. S. C. Gupta;

  
Dr. Rachana Dashore

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Session – 2017-18-19

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B. Sc. II Year

**Paper I - Conservation forestry**

**Unit – I**

Grassland types in India-their distribution and ecological status. Principles of grassland management-preliminary survey, botanical composition and growth conditions. Grazing intensity, carrying capacity and grazing systems for grassland development. Development and renovation of various grassland types-closure soil and water conservation measures, reseeding with grasses and legumes.

**Unit – II**

Fertilizer application, burning control and economics of pasture development and management. Farm/Social forestry: Definition, objectives scope, limitation and role in soil and water conservation programmes. Agro-forestry systems: Definition and objectives. Land use systems related to agro-forestry. Taungya systems, multiple cropping systems and plantation forestry. Wind breaks and shelter belts for controlling wind erosion.

**Unit – III**

Importance of forest as a natural resource in relation to soil and water, Major forest of India their distribution and composition, Establishment of farm forest- site selection, choice of species, methods, source of stock seed and nursery. Criteria for selection of species for agro-forestry systems in India. Agri-horti system in India- Aims and objectives. Soil working, moisture conservation, species selection and nursery management of fruit trees.

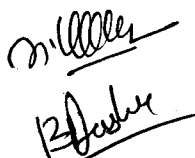
**Unit – IV**

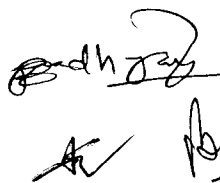
Management and working of fruit trees in different agro-climatic zones. Shifting cultivation: Definition, problems and distribution in India. A forestation of damaged areas and improved conservation measures on agricultural lands. Concept, scope and need for conservation of wild life in nature and its role in soil and water conservation, Scope and objectives, choice of species for various site conditions and planning for A forestation.

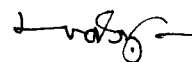
**Unit – V**

Biological measures for control of landslides and rehabilitation of mixed lands. Vegetative measures for torrent training and stream bank protection. Reclamation of gullied and ravine lands through vegetative measures and their economics. Biological measures for reclamation of saline, alkaline and acid soils.









**B.Sc. II Year**

**Paper II - Conservation Agronomy**

**Unit - I**

Botanical classification of crops and its importance. Classification of crop in relation to soil erosion and tolerance to different soil conditions. Role of agronomy in watershed management. Crop production as affected by erosion, water logging, salinity, alkalinity and acidity.

**Unit - II**

Role of acidity, Tilth, organic matter and fertility status in crop land management. Tillage and its relationship with soil structure. Concept of minimum tillage and common tillage practices for water and wind erosion control.

**Unit - III**

Basic principles of cropping systems and common types in India. Monoculture, mixed cropping, cropping sequences and rotation- Definition, advantages and limitations. Advantage and limitation of green manuring and crop suitable for green manuring.

**Unit - IV**

Cropping systems in different regions of India. Economics of different cropping systems. Manures and fertilizers- their importance and availability.

**Unit - V**

Essential elements for soil fertility and plant growth, deficiency symptoms of essential nutrients and their role in plant growth. Soil testing and fertilizers recommendations, Fertilizer needs of different crops and recommended doses for crops based on soil testing. Fertilizer application techniques and assessment of residual impact. Organic manures- methods of handling, storage and application.

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**B.Sc. II year**

**Practical's**

1. Measurements of slope and contour line by the dumpy level in given area.
2. Height measurement of unknown point by the dumpy level.
3. To determine of slope and contour line by the pipe level and 'A' frame in given area.
4. Identification and listing of useful trees with botanical name for degraded lands (Saline, alkaline, acidic, water logging, gullied and ravine lands).
5. Determination of available nitrogen and organic carbon in given soil sample.
6. Determination of available phosphorus ( $P_2O_5$ ) in given soil sample.
7. Determination of available Potash ( $K_2O$ ) in given soil sample.
8. Description and Botanical name of various cereal, legumes and fodder crops.
9. Determination of field capacity, wilting point, calculation of water requirement, infiltration rate.
10. Exposure visits to ICAR/SAU/KVK and other related institutes for seminar/workshop and labs.

**B.Sc. II Year**

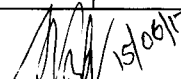
**Paper wise Marks Distribution**

S. No.	Subject	Paper	Paper Name	Maximum Marks
1.	SC&WM	I	Conservation forestry	40
2.	SC&WM	II	Conservation Agronomy	40
3.	SC&WM		Practical Exercise I-20 Marks; Exercise II-10 Marks; Viva-voice-10 Marks; Practical Record-10 Marks	50
4.	SC&WM		Internal Assessment (Quarterly & Half Yearly)	10+10

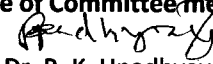
**Section wise Marks Distribution**

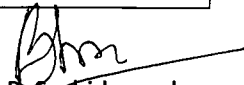
Maximum Marks – 40

S. No.	Section	Total Number of Questions	Marks
1.	A	Objective Type Questions 05 Questions of multiple choice	$5 \times 1 = 05$
2.	B	Short Answer Type Questions 05 with internal choice ( one Question from each unit )	$5 \times 2 = 10$
3.	C	Long Answer Type Questions 05 with internal choice ( one Question from each unit )	$5 \times 5 = 25$

  
Dr. S. K. Verma;


Name of Committee members

  
Dr. R. K. Upadhyay;

  
Dr. B. Sachidanand

  
Reval Singh Kharat;

  
Dr. U. R. Khandkar;

  
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Session – ~~2017-18~~ 19-20

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**B.Sc. III Year**

**Paper I – Rain Water Harvesting & Watershed Management agronomy**

**Unit – I**

1. Water harvesting systems: an overview.
2. Pre- design Survey and site investigations for water harvesting structures.
3. Design criteria for dugout type ponds and their suitability.
4. Embankment type ponds for Water Resource Development site selection and design principles.
5. Water harvesting practices in deferent regions in India.
6. Design procedure for percolation tanks/ponds.
7. Method to control seepage and evaporation losses.

**Unit – II**

1. Layout, construction and maintenance of water harvesting structures.
2. Land levelling for command area development.
3. Methods of irrigation: Surface flooded Sprinkler and Drip.
4. Irrigation efficiencies and water requirement of crop.
5. Drainage: Need, Benefits and Methods.
6. Structure for Water Control diversification in irrigation system.

**Unit – III**

1. Watershed Management concept and planning.
2. Watershed characteristic and their importance in Soil Conservation.
3. Watershed survey for present land used and land capability classification.
4. Engineering Survey and planning for mechanical conservation measures in the watershed.

**Unit – IV**

1. Proposed land use and planning for agronomical measures.
2. Survey and planning for vegetative measures in the Watershed.
3. Preparation for social forestry, Agri-Horticulture and pasture land development plan in the Watershed.
4. Site Selection, Design, and Planning of Water Resource Development Structure in Watershed.





**B.Sc. III Year**

**Paper II - Transfer of Technology and Economic Evaluation**

**Unit – I**

1. Extension in soil conservation: Concept, Scope and objectives.
2. Conventional Systems for transfer of technology: Village Level Extension Workers, Input support Systems, Subsidies and Credit Support Institutions.
3. Role of NGO's in Transfer of Technology.
4. Technology transfer through National demonstration lab to land programmes of ICAR : Objectives and achievements.

**Unit – II**

1. Community Participation in Natural Resource Development.
2. Krishi Vigyan Kendra (KVK's) : A system of technology transfer.
3. Operational Research Projects : History and achievements with special reference to Soil and Water Conservation Programmes.
4. Institutions – Village linkage programmes of ICAR for technology transfer, assessment, and refinement and on farm research.

**Unit – III**

1. Role of Women in technology transfer and agriculture.
2. Top down and bottom up approach for soil and water conservation programmes.
3. Extension activities in Watershed Management.
4. Leadership, team building and group action for Watershed Management Programmes.

**Unit – IV**

1. Concept of contract farming, Mitra Kisan, Mahila Mitra Kisan and Social Institutions.
2. Training and Visit Systems for Human Resource Development.
3. Participatory approaches and people's participation in Soil and Water Conservation Programmes
4. Multimedia training in Participatory Watershed Management.
5. Role of Media – TV, Radio, Kishan Melas, Exhibitions and Cultural methods in technology dissemination.

**Unit – V**

1. Economic Evaluation of Soil and Water Conservation projects – Scope and need.
2. Identification and quantification of costs and benefits.
3. Economic Evaluation Methods – Advantages and limitations.
4. Exercise on Economics Evaluation of Soil and Water Conservation Projects – A case study.
5. Role of financial institutions in Natural Resources Management: Indian experiences.

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**B.Sc. III year**

**Practical's**

Project work on following themes :

Project I- "Study and planning of watershed management program running in different villages" or

Project II- "Evaluation of soil and water losses by measurements/ using different models" or

Project III- "Soil health and nutrient management in a water shed area".

1. Introduction and general description of water shed area.
2. Survey of present land use of water shed area.
3. Soil and land capability survey of water shed area.
4. Participatory rural appraisal analysis.
5. Problems and needs of the water shed area.
6. Recommended management programmes for water shed area.
7. Economic analysis of project.
8. Costs benefit analysis.
9. Conclusion and report writing.
10. Exposure visits to ICAR/SAU/KVK and other related institutes for seminar/workshop and labs.

**B.Sc. III Year**

**Paper wise Marks Distribution**


S. No.	Subject	Paper	Paper Name	Maximum Marks
1.	SC&WM	I	Rain Water Harvesting & Watershed Management agronomy	40
2.	SC&WM	II	Transfer of Technology and Economic Evaluation	40
3.	SC&WM		Practical Data Collection-15 Marks; Preparation of Report-15 Marks; Presentation-20 Marks	50
4.	SC&WM		Internal Assessment (Quarterly & Half Yearly)	10+10


**Section wise Marks Distribution**

Maximum Marks – 40

S.No.	Section	Total Number of Questions	Marks
1.	A	Objective Type Questions 05 Questions of multiple choice	5×1 = 05
2.	B	Short Answer Type Questions 05 with internal choice ( one Question from each unit )	5×2 = 10
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Dr. B. Sachidanand

  
Reval Singh Kharat;

  
Dr. U. R. Khandkar;

  
Dr. S. C. Gupta;

  
Dr. Rachana Dashore

Reference Books for B.Sc. I, II & III Year courses for

SOIL CONSERVATION AND WATER MANAGEMENT

क्र.	पुस्तक का नाम	लेखक	प्रकाशक
1	मृदा अपरदन एवं भूमि संरक्षण	डॉ. त्रिपाठी, डॉ. तुलसीराम राठौर, डॉ. हरिहर प्रसादसिंह	जी. बी. पंत कृषि विश्वविद्यालय पन्तनगर
2	पर्वतीय एवं वन मृदा प्रबन्ध	जय सिंह पाल यादव	जी.बी. पंत कृषि विश्वविद्यालय पन्तनगर
3	मृदा सर्वेक्षण	अवधेश कुमार शर्मा एवं सुमन कुमार	जी.बी. पंत कृषि विश्वविद्यालय पन्तनगर
4	प्रयोगिक मृदा परीक्षण एवं उर्वरक प्रबन्ध	रामसिंह सचान नन्दराम व राजमणि उपाध्याय	जी.बी. पंत कृषि विश्वविद्यालय पन्तनगर
5	वनवर्धन	लक्ष्मण सिंह खन्ना	खन्ना बंधु, देहरादून
6	वन विज्ञान	लक्ष्मण सिंह खन्ना	खन्ना बंधु, देहरादून
7	Manual of Soil & Water Conservation Practice	Gurmel Singh	Oxford & IBH Publication New Delhi
8	Engineering Hydrology	K. Subramanya	Tata McGraw Hill, New Delhi
9	Applied Hydrology	Ven Te Chow	Tata McGraw Hill, New Delhi
10	Hydrology	H.M. Ragjimatj	New Age International Publication New Delhi
11	Principles & Practice of Silviculture	L.S. Khanna	खन्ना बंधु, देहरादून
12	Soil Physics	M.C. Oswal	Oxford & IBH Publication New Delhi
13	भूमि संरक्षण और जल समेट प्रबन्ध	एस.पी. भारद्वाज	ICAR, New Delhi
14	भू-प्रबन्ध एवम् भू संरक्षण	ए.पी. द्विवेदी	हरियाणा साहित्य अकादमी चण्डीगढ़
15	Watershed Management	V.V. Dhruv Narayan Sastry	ICAR, New Delhi
16	Watershed Management	E.M. Tideman	Omiga Scientific Pub. New Delhi
17	Forest Nursery Hand Bokk	C.D. Katoch	Periodical Exeperts Book Agency Delhi
18	Technology for wasteland Development	I.P. Abrol & V.V. Dhruva Narayan	ICAR, New Delhi
19	Integrated Watershed Management	Rajesh Rajora	Rawat Pub. Jaipur
20	Social Foprestry & Environment	Chinnamani Singh & Trivedi	Int. Books & Periodcal Supplires Delhi
21	Recent Advances in Dryland Agriculture Vol. 1	L.L. Somani	Scientific publishers, Jodhpur
22	कृषि वानिकी द्वारा क्षीण भूमि का सुधार	राम नवाज	Agrobios (India), Jodhpur

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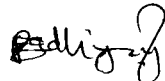
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23	जलग्रहण प्रबन्धन	बी.सी. जाट	Pointer Publisher's Jaipur
24	Methods in environmental analysis water. Soil & air	P.K.Gupta	Agrobios (India), Jodhpur
25	Soil, Plant, Water and fertilizer analysis	P.K.Gupta	Agrobios (India), Jodhpur
26	Soil Fertility	Millar Charles Ernest (18	Biotech Books Delhi
27	मृदा विज्ञान के मौलिक सिद्धांत	वेकटेश भारद्वाज	जी. बी. पंत कृषि विश्वविद्यालय पन्तनगर
28	Soil and Water conservation engineering	R. Suresh	Standard Publishers, distributors, 1705-B nai sadak Delhi, 110006
29	Water shed Hydrology	R. Suresh	Standard Publishers, distributors, 1705-B nai sadak Delhi, 110006
30	Principles of soil conservation and water management	H.R. Arakari & Roy Donahue	Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi


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