Ph. D. Degree Course Syllabus
Department of Soil and Water Conservation
Nagaland University, SASRD, Medziphema

Minimum credit requirements:

Sl. No.	Subject	DOCTORAL PROGRAMME
1	Major	15
2	Minor	08
3	Supporting	05
4	*Library Sciences management, disaster management, etc	Non-credit
5	Seminar	02
6	Research	45
7	Total credits	75
* For students who have not taken such courses at their PG studies		

Course No	Title of the course	Credit
SCN-601	*Advances inwatershed management	2+1
SCN-602	Environment, pollution and management	2+0
SCN-603	*Water management technology	2+0
SCN-604	*Soil and water conservation structures	2+1
SCN-605	Drainage management in crop production	2+1
SCN-606	Irrigation water quality	2+1
SCN-607	*Conservation agriculture	2+1
SCN-608	Conservation Forestry	2+1
SCN-691	Doctoral seminar-I	0+1
SCN-692	Doctoral seminar-II	0+1
SCN- 699	Doctoral research	0+45
* core courses		

Details of the syllabus (Ph. D. Course)

SCN- 601 Advances in watershed management(2+1)

Water resources - management in rural environment. Classification in relation to overall planning-rural community structure and dependence on water; religious and social customs related to water resources / water bodies. Sociological aspects of drought.

Watershed–definition, concept and characteristics of watershed, types and functions of watershed with emphasis on forested watershed. Watershed management- watershed restoration plans, water harvesting, participatory integrated watershed management, recent advances in watershed management. Application of remote sensing and GIS in watershed management.

Practical: Preparation of questionnaire and collection andanalysis of data, estimation of water use efficiency, water harvesting techniques. Identification of problems and management of a watershed, visit to water shed management area. Analysis of digital data using GIS and GPS techniques.Water harvesting Technique.

SCN-602 Environnement, pollution and management (2+0)

Definition, classification and characters of environment. Pollution –definition and classification. UV-radiation and its impact on environment/ biosphere.Nature of pollution – inorganic, organic, natural and anthropogenic. Agricultural and industrial pollution – effect, sources, sink and impacts. C-Cycle, N-Cycle, S-Cycle, Hydrologic cycle and their influence on environment.Cause and effect of pollution on atmospheric, lithospheric and aquatic systems. Impact of deforestation, population explosion, overgrazing and other socio-economic factors on environmental pollution vis-à-vis biosphere. Laws of environmental pollution. Soil quality and soil health, interrelationship among soil quality, soil resilience and soil resistance, factors affecting soil quality, assessment of soil quality, soil organic matter verses soil quality. Climate change, its impact and mitigation.

SCN-603 Water management technology(2+0)

Groundwater, surface water – occurrence and distribution. Surface water and groundwater resources, status and development. Cojunctive use. Water use in crop production. Aquifer - artificial recharge of aquifers, its role in conjunctive use. Water use efficiency and its measurement. Selection of crops and their varieties and cropping pattern with conjunctive use of surface and groundwater.

SCN-604Soil and water conservation structures (2+1)

Concept of mechanical control of soil erosion, Factors affecting on soil erosion. Structural design and construction –Contour terraces, contour bundings, terracing, Spillways: box-inlet spillway, chute spillway; diversion drains, design of dams and culverts.

Practical : Design criteria of different structures, project works and study tour.

SCN-605 Drainage management and crop production (2+1)

Drainage in agriculture, adoption of plants to soil moisture stress condition. Drainage and physical condition; drainage and cultivation practices – tillage, weed control, etc. Drainage and waterlogging, salinity and nutrient supply. Groundwater table and crop production. Type of drainage and their designs. Maintenance of drainage structures.

Practical: Determination of drainage requirement, drainage co-efficient, percolation rate, criteria for spacing of different drainage systems.Measurement of irrigation water through flumes and weirs;

SCN- 606 Irrigation water quality (2+1)

Irrigation water – quality, criteria and classification based on EC, SAR and boron content, interpretation of water quality, crop tolerance to salts use of saline water in agriculture, its effect on soil properties and crop growth, management practices to use of saline/brackish water for irrigation.

Practical: Sampling of water from different sources. Determination of EC, pH, carbonates, bicarbonates, cations and anaions . Interpretation of irrigation water quality.

SCN-607Conservation agriculture (2+1)

Concept of conservation farming, conservation irrigation, role of vegetation and cropping in conservation farming, mulching and tillage in conservation agriculture, conservation and recycling of natural resources – renewable and non-renewable natural resources and their conservation planning. Conservation tillage – definition, types, advantages, conservation tillage on soil fertility, soil water and crop production, no till, mulch till, and crop residue management in conservation agriculture.

Practical: Tillage implements, practice of no tillage, minimal tillage, mulch tillage, ridge tillage, identification of grasses and legumes,

SCN – 608 Conservation Forestry (2+1)

Forestry- Types of forest.Forest classification: Farm forestry, Social forestry, Community forestry, and Agro-forestry. Deforestation and its consequences. Forest destruction- effect of natural and anthropogenic factors on soil and site. Forest ecosystem, Forest, Rangeland and Grassland management. Silviculture: Silviculturalpractices of some important forest plants. Afforestation with special reference to degraded land, ravines, gullied area, waterlogged area, saline and alkaline area, steep hilly,bouldry area and mined areas. Choice of species or each problem site. Regeneration forest - techniques of propagation. Role of forestry in conserving soil and water. Grasses and legumes in conservation purposes, environmental benefits of conservation

Practical: Forest Measurement of height, canopy, dbh and density of forest species. Identification of important grasses, shrubs and trees in nearby locality. Timber and Tree,Growth and Yield Tables, Forecasting, Modeling and Simulation Tree-Ring Analysis. Visit to institutes related to forestry and submission of field report.

Suggested Readings:

SCN- 601 Advances in watershed management(2+1)

FAO Conservation Guide 1, 1977. Guidelines for Watershed Management.
Khan, I, 1987. Wastelands afforestation. Oxford & IBH Publishing Co., Pvt., New Delhi.
Lal, R and E. W. Russell (eds). 1981. Tropical Agricultural Hydrology. John Wiley & Sons, New York.
Tideman, E.M. 1996. Watershed Management. Omega Scientific Publication, New Delhi.
N. N. Goswami (Chairman) Eds. 2012 Fundamentals of Soil Science, Published by Indian Society of Soil Science, New Delhi
Panda, S. C. 2012. Soil Conservation and Fertility Management, Agrobios (India), Jodhpur
Isobel W. Heathcote 2009. Integrated Watershed Management- Principles and practices 2nd Edn. John Wiley & Sons, INC
Devis Todd 2008. Hydrology
Raghunath 2010. Principles of Hydrology

SCN-602 Environnement, pollution and management (2+0)

Blanko, H. and Lal, R 2008. Principles of Soil Conservation and Management, Springer
Singh, K.K., J. Asha, A.K. Singh and A. Tomar (eds.). 2007. Air, Water and soil pollution. Kalyani Publishers, Ludhiana.
Morgan, R.P.C. 2005. Soil Erosion and Conservation. Blackwell Publishing, Malden, USA.
Munir, O., Ahmet, R. M. and Ali C. 2011Urbanisation, Land Use, Land Degradation and Environment, Daya Publishing House, Delhi

SCN-603 Water management technologyand conjunctive use of surface and groundwater (2+0)

Monteith, J. and C. Webb. 1981. Soil, Water and Nitrogen; MartinusNijhoot, Dr. W. Junk Publishers, The Hague.
N. N. Goswami (Chairman) Eds. 2012 Fundamentals of Soil Science, Published by Indian Society of Soil Science, New Delhi
Martin Burton 2010. Irrigation Management , Principles and Practices, CABI
Kolay, A. K. 2008. Water and Crop Growth, Atlantic Publishers & Distributors Pvt. Ltd.
Reddy and Reddy2012. Principles and Practices of Agronomy

SCN-604Soil and water conservation structures (2+1)

SCN-605 Drainage management and crop production (2+1)

Bhattacharaya, A.K and A.M. Micheal. 2003. Land Drainage. Vikas Publishing house Pvt. Ltd. New Delhi..
Luthin, J.N. 1978. Drainage Engineering. Wiley Eastern Ltd., New Delhi.
Brady, N.C,. 1995. The nature and properties of soils. Printice Hall India Pvt. Ltd. New Delhi.

SCN- 606 Irrigation water quality (2+1)

P. Schjonning, S. Elmholt and B. T. Christensen 2004. Managing Soil Quality – Challenges in Modern Agriculture, CABI Publishing
Russell, E. W. 1973. Soil Conditions and Plant growth. Longman Group Ltd., London.
Brady, N.C,. 1995. The nature and properties of soils. Prentice Hall India Pvt. Ltd. New Delhi.

SCN-607Conservation agriculture (2+1)

P. Schjonning, S. Elmholt and B. T. Christensen 2004. Managing Soil Quality – Challenges in Modern Agriculture, CABI Publishing
Blanko, H. and Lal, R 2008. Principles of Soil Conservation and Management, Springer
Russell, E. W. 1973. Soil Conditions and Plant growth. Longman Group Ltd., London.
Joseph F. Cox and Layman E. Jackson 2011. Crop Management and Soil Conservation, 2nd Edn, Biotech Books, delhi
Brady, N.C,. 1995. The nature and properties of soils. Prentice Hall India Pvt. Ltd. New Delhi.

SCN – 608 Conservation Forestry (2+1)

Lawrance, B. R. Stinner and J. H. Garfield (eds). 1984. Agricultural Ecosystems. John Wiley & Sons, New York.
Tisdale, S.L, Nelson, W.L., J.D. Beaton, and J.L. Halvin. 2002. Soil fertility and fertilizers. 5th edition, Prentice-Hall of India, Pvt., Ltd., New Delhi.
John K. Whalen and Luis, Sampedro 2009 Soil ecology & management, CABI publishing