

TEACHING PLAN: Geo-informatics, Nanotechnology and Precision Farming

SCHOOL: (SOAS) SCHOOL OF AGRICULTUR AL SCINCES		ACADEMIC SESSION: 2023 – 2024		FOR STUDENTS’ BATCH: 2021-2025		
1	Course No.	AAG-T-301				
2	Course Title	Geo-informatics, Nanotechnology and Precision Farming				
3	Credits	1+1				
4	Learning Hours		Contact Hours	72		
			Assessment	9		
			Guided Study	9		
			Total hours	90		
5	Course Objective	1. To introduce the basic concepts of geo-informatics and nanotechnology 2. To create awareness about various applications of geo-informatics and nanotechnology for precision agriculture 3. To teach basic handling of various geo-infomatic tools 4. Introduction to crop Simulation models 5. Introduction of Precision agriculture				
6	Course Outcomes	1. The concept of "doing the right thing in the right place at the right time" has a strong intuitive appeal which gives farmers the ability to use all operations and crop inputs more effectively. 2. More effective use of inputs results in greater crop yield and/or quality, without polluting the environment. 3. Precision agriculture can address both economic and environmental issues that surround production agriculture today. 4. Encourage the farmers to study of spatial and temporal variability of the input parameters using primary data at field level. 5. Creating awareness amongst farmers about consequences of applying imbalanced doses of farm inputs like irrigation, fertilizers, insecticides and pesticides.				
7	Outline syllabus:					
7.01	Paper Code	Unit	Introduction	Page Numbers ¹	Lect ures	
7.02	AAG-T-301	Unit I (Introduction of Precision agriculture & Geo-informatics)	1. Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture	748-754	2	
			2. Geo-informatics- definition, concepts, tool and techniques	754-756	2	
			3. Uses of Geo-informatics in Precision Agriculture	757-758	1	
		Unit II (GIS & Remote Sensing)	1. Crop discrimination and Yield monitoring	759-761	2	
			2. Soil mapping	764	1	
			3. Fertilizer recommendation using geospatial technologies	765-767	2	
			4. Spatial data and their management in GIS	768	2	
			5. Remote sensing concepts and application in agriculture.	772-775	2	
		Unit III (GPS & STCR)	1. Image processing and interpretation	775-777	2	
2. Global positioning system (GPS), components and its functions;	777		2			
3. Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs;	780-793		3			
	4. STCR approach for precision agriculture.	789	2			

		Unit IV (Nanotechnology)	1. Nanotechnology, definition, concepts and techniques, 2. Brief introduction about nanoscale effects, 3. Nano-particles, 4. Nano-pesticides, 5. Nano-fertilizers, nano-sensors, 6. Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.	793-811	3 2 1 1 1 1
8	Course Evaluation				
8.1	CA: 10%				
8.1.1	Attendance	25 %			
8.1.2	Homework	2 Assignments, 50%			
8.1.3	Quizzes	2 Quizzes, 25%			
8.1.4	Projects	-			
8.1.5	Presentation	-			
8.1.6	Any other	Practical Examination- 30%			
8.2	MTE	10%			
8.3	End-term examination: 50%				
9	Text Books & References				
9.1	Text book	1. Hand book of Agriculture, ICAR Publication. 1. Text book of Agronomy.			
9.2	References	2. Reddy, S.R. Principles of Agronomy Kalyani Publishers, Ludhiana, India. 3.			
9.3	Video References	1.			

Outcome no. → Syllabus topic↓	1	2	3	4	5
Paper Code.Unit I (1)	✓	✓	✓	✓	✓
Paper Code. Unit I (2)	✓		✓		
Paper Code. Unit I (3)	✓		✓		
Paper Code.Unit II (1)		✓	✓	✓	
Paper Code. Unit II(2)	✓	✓	✓		
Paper Code. Unit II(3)			✓		✓
Paper Code. Unit II(4)		✓	✓		
Paper Code. Unit II(5)	✓		✓		✓
Paper Code.Unit III (1)	✓			✓	
Paper Code.Unit III (2)	✓		✓	✓	
Paper Code.Unit III (3)	✓		✓	✓	
Paper Code.Unit III (4)	✓	✓		✓	
Paper Code.Unit IV (1)	✓	✓			✓
Paper Code.Unit IV (2)	✓	✓			✓
Paper Code.Unit IV (3)	✓	✓			✓
Paper Code.Unit IV (4)	✓	✓			✓
Paper Code.Unit IV (5)	✓	✓			✓
Paper Code.Unit IV (6)	✓	✓			✓

QUESTION BANK

Section-A

1. The navigation system based on a network of satellites that helps users to record positional information

A) GPS B) GIS C) Remote sensing D) All the above ANS: A

2. The concept of SSNM in rice was developed in cooperation with researchers across _____.

A) Africa B) South America C) Asia D) Europe ANS: C

3. The required fertiliser N is distributed in several applications during the crop growing season using tool like the _____.

A) Specific leaf area B) Leaf area index C) Leaf colour chart D) None of the above ANS: C

4. _____ are automatic and may be applied to numerous farming operations.

A) Variable rate application B) Variable rate applicator
C) Variable rate technologies D) All the above

ANS: C

5. Geoinformatics is a new discipline concerned with the _____ of spatial data and the processing techniques in spatial information systems.

A) Modelling B) Probabilistic model C) Deterministic model D) None of the above
ANS: A

6. _____ Can be defined as a system for capturing, storing, checking and displaying data which are spatially referenced to the earth.

A) GIS B) GPS C) Variable rate applicator D) Remote sensing ANS: A

7. _____ is used to operationalise precision farming at the farm level

A) Variable rate applicator B) Variable rate technology
C) Variable rate application D) None of the above

ANS: A

8. _____ is the process of defining image characteristics or features which effectively provides meaningful information for image interpretation.

A) Feature extraction B) Spectro radiometer GIS
C) Hydro spectral data D) None of the above

ANS: A

9. Band selection is one of the important steps in _____

A) Remote sensing B) Hydrospectral data
C) Hyperspectral remote sensing D) All the above

ANS: C

10. _____ can be used as potential variables for crop type discrimination.

A) Narrow band vegetation indices B) Physiological indices
C) Stress indices D) All the above

ANS: A

11. _____ includes water, pigments, other nitrogen – rich compounds and plant structural materials.

A) Structural properties B) Biochemical properties
C) Spectral indices D) None of the above

ANS: B

12. The most important assets of the LBP operator in real world applications is its robustness monotonic _____ changes instigated

A) Gray – scale B) Blue – scale C) Spectral indices D) All the above

ANS: A

13. _____ utilise the spectral variations for classification.

A) Computer aided techniques

B) Visual image interpretation

C) Computer techniques

D) None of the above

ANS: A

14. _____ information is used in conjunction with crop area statistics to obtain crop production

A) Crop yield

B) Crop productivity

C) Both A & B

D) None of the above

ANS: A

15. Scale used for mapping multispectral satellite data is _____

A) 1:20000

B) 1:500

C) 1:50,000

D) 1:5000

ANS: C

16. Fertilizer recovery efficiency of N in rice ranges from

A) 20-30 per cent

B) 80-90 per cent

C) 40-60 per cent

D) 60-70 per cent

ANS: C

17. Fertilizer recovery efficiency of P in rice ranges from

A) 10-20 per cent

B) 60-70 per cent

C) 30-40 per cent

D) 20-30 per cent

ANS: D

18. _____ is most populate nutrient decision support software that uses principles of SSNM

A) Nutrient Expert

B) Nutrient wizard

C) Fertilizer Expert

D) Fertilizer support

ANS: A

19. A precision instrument used to measure chlorophyll content is

A) SPAD meter

B) LCC

C) Green Seeker

D) Quantum sensor

ANS: A

20. The co-ordinate reference system used by GPS is known as

A) WGS 45

B) WGS 84

C) WGS 89

D) WGS 88

ANS: B

21. Ratio of semi-major and semi minor axis is called _____

A) Inverse flattening

B) Outward flattening

C) Inverse Curving

D) Straightening

ANS: A

22. The zero degrees longitude is termed as _____

A) Anti meridian

B) Prime meridian

C) Equator

D) Tropic of cancer

ANS: B

23. The science of measurement and mapping of earth's surface is _____

A) Geodesy

B) Geoid

C) CRS

D) OGC

ANS: A

24. The idea of nanotechnology was first time introduced by _____

A) Richard Feynman

B) Nori Taniguchi

C) Richard Flemming

D) Richard Williams

ANS: A

25. The word "Nano" came from _____

A) Greek word

B) Italian word

C) Latin word

D) French word

ANS: A

26. The term nanotechnology was first time used by _____

A) Richard Feynman

B) Nori Taniguchi

C) Richard Flemming

D) Richard Williams

ANS: B

27. The process of identifying a location by one or more attributes from a base layer is _____

A) Georeference

B) Geoid

C) GIS

D) Geocode

ANS: D

28. A pillar like structure on the wing of an aircraft used for carrying an engine, weapon or other load is _____

A) Pylon

B) Pilose

C) Boot

D) Cabin

ANS: A

29. The ratio between distance or area on a map and corresponding distance or area on ground is _____

A) Model

B) Chart

C) Scale

D) Image

ANS: C

30. Size range on a nanoscale usually ranges from

A) 1-10 nm

B) 1-100 nm

C) 100-200nm

D) 0-1 nm

ANS: B

Section B (Short Answer Question)

1. Define Precision Farming? Enlist the components of Precision Farming?
2. Write the specific uses of sensor technologies in farm operations?
3. Enlist the steps in technology development and strategies for precision farming?
4. Define Geo-informatics?
5. Define Agro-geo-informatics?
6. Define Remote sensing?
7. Define Feature extraction
8. Explain grey level co-occurrence matrix?
9. What is the importance of hyper spectral remote sensing?
10. Define Ymax?
11. Write short notes on Indigenous Nutrient Supply
12. How GIS works?
13. What is geospatial data?
14. Define geodesy?
15. Define Co-ordinate system?
16. Define geodetic datum?
17. Define Co-ordinate transformations?
18. Enlist the agricultural applications of remote sensing? Explain in detail?
19. What are the applications of GPS?
20. Define GPS and explain in brief the components of GPS?
21. Briefly explain the functions of GPS?
22. Define simulation?
23. Define continuous simulation and discrete simulation?
24. When to use Simulation?
25. Define modelling and enlist the types of modelling
26. What are the three measurable sources of STCR approach?
27. What is STCR?
28. Define Nanoscience?
29. Define Nanotechnology?
30. Define Nanoparticle?
31. What are the three major physical properties of nanoparticle?
32. What are the two main approaches used in nanotechnology?
33. Define nanopesticide?
34. Define nanofertilisers?
35. Define nanosensors?
36. Define nanobiosensors?
37. What are the characteristics ideal for nanobiosensor?
38. What are the potential applications of nanotechnology in agriculture?

Section C (Long Answer Question)

1. Explain in detail different steps involved in precision farming and what are the advantages of precision farming to farming?
2. Define GIS, GPS and write for specific advantages of GPS in farm operations?
3. Define geographic information system? Write the five major components and three main sub systems of geographic information system?
4. Enlist the importance of GIS and explain?

5. Define remote sensing, enlist components of remote sensing and explain?
6. Write short notes on modelling process?
7. What do you mean by simulation modelling and write in brief on areas of application?
8. Write some potential applications of nano-biosensors and explain?
9. Role of nanotechnology in agriculture and explain in brief?