Curriculum Book

and

Assessment and Evaluation Scheme

based on

Outcome Based Education (OBE)

in Master of Science (Agriculture) In Agronomy

2 Years Degree Program

Revised as on 01 August 2023 Applicable w.e.f. Academic Session 2023-24



AKS University

Satna 485001, Madhya Pradesh, India

Faculty of Agriculture Science and Technology
Department of Agronomy

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HEAL

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Professor B.A. Chopade Vice - Chancellor AKS University Satna, 485001 (M.P.)



Department of Agronomy
Faculty of Agriculture Science and Technology
Curriculum &Syllabus of Agronomy program
(Revised as on 01 August 2023)

Forwarding

I am delighted to observe the updated curriculum of the Department of Agronomy for M.sc Ag in Agronomy Program, which seamlessly integrates the most recent trends and corporate affairs in the field of Agronomy and adheres to the guide lines set forth by ICAR The revised curriculum also thoughtfully incorporates the directives of NEP-2020.

The alignment of course outcomes (COs), Programme Outcome (POs) and Programme specific outcomes (PSOs) has been intricately executed, aligning perfectly with the requisites of NEP-2020 and NAAC standards. I hold the belief that this revised syllabus will significantly enhance the skills and employability of our students.

With immense satisfaction, I hereby present the revised curriculum for the MBA program for implementation in the upcoming session.

ER. Anant Soni
Pro Chancellor & Chairman
AKS University, Satna

01August 2023



Department of Agronomy
Faculty of Agriculture Science and Technology
Curriculum & Syllabus of Agronomy program
(Revised as on 01August2023

From the Desk of the Vice-Chancellor

AKS University is currently undergoing a process to revamp its curriculum into an outcome based approach, with the aim of enhancing the teaching and learning process. The foundation of quality of quality education lies in the implementation of a curriculum that aligns with both societal and industrial needs, focusing on relevant outcomes. This entails dedicated and inspire Faculty members, as well as impactful industry internships.



Hence, it is of utmost importance to begin this endeavor by crafting an outcome-based curriculum in collaboration with academia and industry experts. This curriculum design should be informed by the latest technological advancements, market demands, the guidelines outlined in the National Education Policy (NEP) of 2020, and sustainable goals.

In the curriculum, I am pleased to observe that the Agronomy Department has diligently adhered to the future prospects of the agriculture science. To achieve excellence in the curriculum planning pertaining to agriculture by periodically updating it in order to provide to students with sound technical knowledge of outcome based education and to strengthen the research activities in agriculture science by under taking innovative approaches for the developing the field of agriculture. This curriculum will be beacon of light particularly to the student of agriculture science job/Career prospects in the field of teaching, research and extension activities in either Government or Private sector.

I am confident that the updated curriculum for agriculture will not only enhance student's technical skills but also contribute significantly to their employability during the process of revising. This curriculum has been adopted as par the guideline of ICAR PG Restructuring Committee

Curriculum revision in an ongoing and dynamic process designed to address the continuous evolution of technological advancement and both local and global concerns. AKS University warmly invites input and suggestion from horticulture experts researchers and alumni students to enhance the curriculum and make it more students cantered your valuable insights will gently contribute to shaping as education that best serves the needs and aspirations of the students.

01August2023

Professor B.A. Chopade Vice-Chancellor AKS University, Satna



Department of Agronomy
Faculty of Agriculture Science and Technology
Curriculum & Syllabus of Agronomy program
(Revised as on 01August2023)

Preface

As part of our commitment to ongoing enhancement, the department of agriculture consistently reviews and updates its M.Sc. (Ag.) Agronomy programme curriculum every four and two years. Through this process, we ensure that the curriculum remains aligned with the latest technological advancements, as well as local and global industrial and social demands.

During this procedure, the existing curriculum for the M.Sc.(Ag.) Agronomy programme undergoes evaluation by a panel of technocrats, industry specialists, and academics. Following meticulous scrutiny, the revised curriculum has been formulated and is set to be implemented starting from August 01, 2023. This implementation is contingent upon the endorsement of the curriculum by the University's Board of Studies and Governing Body.

This curriculum as per guidelines of Restructured and Revised Syllabi of Post-graduate Programmes of ICAR. In order to foster the holistic skill development of students, a range of practical activities, including Hands-On Training, Industrial Visits, Project planning and execution, Thesis Writing, Seminars, have been incorporated.

To ensure a comprehensive learning experience, detailed evaluation schemes and rubrics have also been meticulously provided.

For each course, a thorough mapping of Course Outcomes, Program Outcomes, and Programme Specific Outcomes has been undertaken. As the course syllabus is being meticulously developed, various elements such as session outcomes, laboratory instruction, classroom instruction, self-learning activities, assignments, and mini projects are meticulously outlined.

We hold the belief that this dynamic curriculum will undoubtedly enhance independent thinking, skills, and overall employability of the students.



Faculty of Agriculture Science and Technology Department of Agronomy

Introduction

The faculty of Agricultural Science and Technology at AKS University has been a pioneer in promoting agricultural education and research. Among its various departments, the department of Agronomy holds a significant position. Established in 2014, this department has played a crucial role in advancing the field of Agronomy through its dedicated focus on teaching, research, and extension activities.

At the heart of its existence is the commitment to imparting knowledge and skills to students pursuing agricultural sciences. The Department of Agronomy offers comprehensive academic programs that equip students with the theoretical foundations and practical expertise required for successful careers. Through rigorous coursework and hands-on training, students gain insights into crop production systems, soil management techniques, weed control strategies, and sustainable farming practices.

The Department of Agronomy at AKS University stands as a testament to its unwavering commitment to advancing agricultural sciences. As it continues to evolve with changing times, the department remains dedicated to nurturing future generations of skilled agronomists who will contribute towards global food security and sustainable farming practices.

Vision -

Enhance the knowledge about the innovative technology for increasing the crop production and boost up the Indian economy. Promoting the responsible, ethical use and management of air, water, soil, plant and animal resources including sustainability in agricultural practices are vision of department of agronomy.

Mission

M-1: The mission of the department of agronomy is to advance understanding of the biology of agronomical crops and their interactions with soil. The faculty focuses on all aspects of the production technology of various crops.

M-2:The department provides experiential educational and research opportunities to prepare the next generation of scientists and global citizens to be competent in resolving the complex challenges of the 21st century and in providing a healthy and secure food supply while protecting our environment.

M-3: In order to become a dynamic and effective future leader in agronomy, one must develop an interdisciplinary global perspective. The department aims to strengthen the economy and quality of life for society by developing human resources, technologies, and products.

M-4: it is our aim to be a world leader in research, teaching, and extension involving plant health while serving the changing needs of society, the environment, and the university.



Faculty of Agriculture Science and Technology Department of Agronomy

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO-1

Imparting subject-related knowledge along with developing a connection between practical solutions and theory

PEO-2

Generate knowledge through training in cognitive, affective, and psychomotor, which are necessary for productive research in a selected area of crop agronomy

PEO-3

To enhance visibility and impact of post graduate programs in agricultural sciences and students will be trained various pathways for manifesting their objectives in carrier of the students.

PEO-4

Ability to obtain impact of professional activities in agriculture for improvement of socioeconomic condition of the farmers.

PEO5:

To become a face among the farming community through providing support in advance cropproduction technologies.

PROGRAM OUTCOMES (POs)

PO-1

Specific knowledge of various branches of agronomy will be made specialized and to provide knowledge dissemination regarding various technique of farming and farming system in India.

PO-2

Wide knowledge in the concerning subject which will improve the farmers condition through student's contributions.

PO-3

Detailed knowledge regarding package and practices soil fertilizer and water management of productive crop aspects.

PO-4

Use appropriate scientific methods collaboration with statistics along with evaluation which will proved to decision in various part of agriculture.

PO-5

Detailed knowledge of cultivation practices, soil, fertilizers, water management and plant protection economic associated with farming enterprises.

PO-6

Create, select and apply an appropriate techniques, resources and modern it tools in improvement of agronomical package and practices.

PO-7

Student will apply various statistical methods to analyze their master research work

PO-8

Student will apply basic concepts in laboratory techniques during their research work

PO-9

Understand the impact of the professional expert solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development in Agriculture.

PROGRAMME SPECIFIC OUTCOMES (PSO_S)

PSO-1

Enable to recognize and examine the relationships between inputs and outputs in their agricultural field to make effective and profitable decisions. To understand the mechanics of agri Entrepreneurship.

PSO-2

Acquainting with basic concepts theories and terminology of Agronomy.

PSO-3

To undertake teaching research and extension activates along with administrative and consultancy services.

PSO-4

Apply research and expertise in resolving the problems of existing farm in the periphery of universities.

PSO-5

To understand and analyze the current issues that are occurring in local and global agriculture and how they will affect futuristic agriculture

Consistency/Mapping of PEOs with Mission of the Department

PEO	M1	M2	M3	M4
PEO1	2	3	3	3
PEO2	2	3	2	3
PEO3	1	2	2	3
PEO4	2	2	3	3
PEO4	1	2	3	2
PEO5	3	2	3	1

^{1:} Slight (Low) 2: Moderate (Medium) 3: Substantial (High) 4: No correlation

GENERAL COURSE STRUCTURE & THEME

1. Definition of Credit

1 Hr. Lecture (L) per	1 Credit
week	
1 Hr. Tutorial (T) per	1 Credit
week	
2 Hours Practical (P)	1 Credit
per week	

2. Range of Credits:

In the light of the fact that a typical Model Two-year Post Graduate degree program in Agricultural has about 74 credits, the total number of credits proposed for the Two-year M.Sc. Ag Agronomy is kept as PG Restructuring Committee for ICAR considering NEP-20 and NAAC guidelines.

Components of the Curriculum

(Program curriculum grouping based on course components)

Sl No	Course Component	Total Credits	Percentage of total credits in the Program
1	Program Core (PCC)	22	29.73
2	Minor courses (PEC)	09	12.16
3	Supporting Courses (PSC)	07	9.46
4	Research Project(s) (PRC)	15	20.27
5	Industrial Training/Internships (ISC)	00	0.00
6	Seminar (SC)	16	21.62
	Total Credit		
6	Any other (PlSpecify)Non-Credit(NC)	05	6.76
7	Entrepreneurship (EC)	00	00
	Total Non-Credit	74	100

General Course Structure and Credit Distribution

Curriculum of M.Sc Ag Agronomy

Curriculum of M.Sc Ag Agronomy					
Semester -I		Semester -II			
Course Title	Credit	Course Title	Credit		
Major Courses		Major Courses			
Modern Concept In Crop Production	3+0+0=03	Principles and Practices of weed Management	2+0+1 = 03		
2. Principles And Practices Of Soil Fertilityand Nutrient Management	2+0+1=03	Principles and Practices of Water Management	2+0+1=03		
3. Agronomy Of Major Cereals And Pulses.	2+0+0 = 02	3. Principles and Practices Of Organic Farming	2+0+1=03		
4. Cropping System and sustainable Agriculture	2+0+0 = 02	Dryland farming and Watershed Management	2+0+1=03		
Minor Courses		Minor courses			
5. Soil Biology and Biochemistry	2+0+1=03	5. Principles Of Plant Physiology	2+0+1=03		
6. Soil, Water and Air Pollution	2+0+1=03				
Supporting Courses		Supporting Courses			
7. Statistical Methods in Applied Science	3+0+1=04	6. Experimentaldesign	2+0+1=03		
Non-Credit Compulsory Courses		Non-Credit Compulsory Courses			
8. Library And Information Services	0+1+0=01	7. Intellectual Property And Its Management In Agriculture	1+0+0=01		
9. Technical Writing and Communications Skills	0+1+0=01	8.Basic Concepts In Laboratory Techniques	0+0+1=01		

Total Credit	22	Total Credit	20
Semester -III		Semester -IV	•
Course Title	Credit	Course Title	Credit
Research			
Master's Research	0+15=15	Master's Research seminar	0+15=15
Master's Seminar	0+1=1		
Non-Credit Compulsory	Courses		
Agricultural Research, Research	1+0=1		
Ethics and Rural Development			
Programmes			
Total Credit	17	Total Credit	15

- 1. Program Core (PCC)
- 2. Supporting Courses (PSC)
- 3. Research Project(s) (PRC)
- 4. Industrial Training/Internships (ISC)
- 5. Seminar (SC)
- 6. Any other (Pl Specify) Non-Credit (NC)
- 7. Entrepreneurship (EC)

Total Credit: 74

Course code and definition:

L = Lecture

T = Tutorial

P = Practical

C = Credit

Course level coding scheme:

- 1. **Professional core courses** = PCC
- 2. **Professional elective =**PEC
- 3. **Supporting Courses** =PSC
- 4. **Research Project(s)** =PRC
- 5. Industrial Training/Internships =ISC

6. **Seminar** =SC

7. Any other (PlSpecify) Non-Credit = NC

8. **Entrepreneurship** =EC

Three-digit number used as suffix with the Course Code for identifying the level of the course. Digit at five hundred's place signifies the year in which course is offered. e.g. 501,502 etc. for course code.

Category-wise Courses PROFESSIONAL CORE COURSES [PCC] / Major Course (Total 20)

Sl.	Code No.	Subject	Semester	Credits
1	Agron501	Modern Concept in Crop Production	I	3+0+0=3
2	Agron502	Principles And Practices Of Soil Fertility and Nutrient Management	I	2+0+1=3
3	Agron506	Agronomy Of Major Cereals and Pulses.	I	2+0+0=2
4	Agron511	Cropping System and Sustainable Agriculture	I	2+0+0=2
5	Agron 503	Principles and Practices Of Weed Management	II	2+1+0=3
6	Agron 504	Principles and Practices Of Water Management	II	2+1+0=3
7	Agron 513	Principles and Practices Of Organic Farming	II	2+1+0=3
8	Agron 512	Dryland Farming and Watershed Management	II	2+1+0=3
		Total Credit		22

PROFESSIONAL ELECTIVE =PEC/ Minor course (Total 08)

Sl.	Code No.	Subject	Semester	Credits
1	Soil 506	Soil Biology and Biochemistry	I	2+0+1 = 3
2	Soil 508	Soil, Water and Air Pollution	I	2+0+1 = 3
3	APP 501	Principles of Plant Physiology	II	2+0+1 = 3
		Total Credit		9

SUPPORTING COURSES = PSC (Total 06)

Sl.	Code No.	Subject	Semester	Credits
1	STAT 502	Statistical Methods in Applied Science	I	3+0+1=4
2	STAT 511	Experimental Design	II	2+0+1=3
		Total Credit		07

RESEARCH PROJECT(S) =PRC (Total 30)

Sl.	Code No.	Subject	Semester	Credits
01	Agron 599	Master's Research	III	0+0+15=15
		Total Credit		15

SEMINAR =SC(Total 01)

Sl.	Code No.	Subject	Semester	Credits
01	Agron 591	Master's Seminar	III	1+0+0=1
02	Agron 599	Master's Research Seminar	IV	0+0+15=15
		Total Credit		16

ANY OTHER (PL SPECIFY) NON-CREDIT =NC (Total 05)

Sl.	Code No.	Subject	Semester	Credits
01	PGS 501	Library and information services	I	0+0+1=1
02	PGS 502	Technical writing and communications	I	0+0+1=1
		skills		
03	PGS-503	Intellectual property and its management in agriculture	II	1+0+0=1
04	PGS 504	Basic concepts in laboratory techniques	II	0+0+1=1
05	PGS 505	Agricultural Research, Research Ethics and	Ш	1+0+0=1
		Rural Development programmes		
		Total Credit		05

Induction Program

Induction program for students to be offered right at the start of the first year It is mandatory. AKS University has design an induction program for 1st year student, details are below:

- i Physical activity
- ii Creative Arts
- iii Universal Human Values
- iv Literary
- v Proficiency Modules
- vi Lectures by Eminent People
- vii Visits to local Areas
- viii Familiarization to Dept./Branch & Innovations

Mandatory Visits/ Workshop/Expert Lectures:

- I. It is mandatory to arrange one industrial visit every semester for the students.
- II. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.
- III. It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from industry.

Evaluation Scheme:

- 1. For Theory Courses:
 - I. The Weightage of Internal assessment is 50% and
 - II. End Semester Exam is 50%

The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

2.- For Practical Courses:

- I. The Weightage of Internal assessment is 50% and
- II. End Semester Exam is 50%

The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

3. For Summer Internship / Projects / Seminar etc.

Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Semester wise Course Structure

Semester wise Brief of total Credits and Teaching Hours

Semester	L	T	P	Total Hour	Total Credit
Semester -I	16	00	06	22	22
Semester -II	13	00	07	20	20
Semester -III	02	00	15	17	17
Semester -IV	00	00	15	15	15
Total	31	00	43	74	74



Faculty of Agriculture Science and Technology

Department of Agronomy

2 year / 4 Semester Curriculum Structure Total Credit (2 year / 4 Semester Course) **74**

Semester wise Structure Curriculum

(L= Lecture, T= Tutorial, P= Practical & H = Hours per week)

SEMESTER-1

S.N.	Category	Code	Course Title		Т	P	Total H	Credits
			MajorCourses					
1	PCC	Agron 501	Modern concept in crop production	3	0	0	3	3(3+0)
2	PCC	Agron 502	Principles and practices of soil Fertility and nutrient management	2	0	1	3	3(2+1)
3	PCC	Agron 506	Agronomy of major cereals and pulses.	2	0	0	2	2(2+0)
4	PCC	Agron 511	Cropping system and sustainable agriculture	2	0	0	2	2(2+0)
			Total				10	10(9+1)
			MinorCourses	•				
5	PEC	Soil 506	Soil Biology and Biochemistry	2	0	1	3	3(2+1)
	PEC	Soil 508	Soil, Water and Air Pollution	2	0	1	3	3(2+1)
			Total				6	6(4+2)
			Supporting Courses	I.				
6	PSC	STAT502	Statistical methods in applied Science	3	0	1	4	4(3+1)
			Total				4	4(3+1)
			Non-Credit Compulsory Courses	•				
7	NC	PGS502	TechnicalWriting and communication skill	0	0	1	1	1(0+1)
8	NC	PGS501	Library and in formation services	0	0	1	1	1(0+1)
			Total				2	2(0+2)
			Grand Total	16	00	06	22	22(16+6)



Faculty of Agriculture Science and Technology

Department of Agronomy Semester wise Structure Curriculum

(L= Lecture, T= Tutorial, P= Practical & H = Hours per week)

SEMESTER-II

S.N.	Category	Code	Course Title	L	T	P	Total H	Credits
			MajorCourses					
1	PCC	Agron 503	Principles and Practices Of Weed Management	2	0	1	3	3(2+1)
2	PCC	Agron 504	Principles and Practices Of Water Management	2	0	1	3	3(2+1)
3	PCC	Agron 513	Principles and Practices Of Organic Farming	2	0	1	3	3(2+1)
4	PCC	Agron 512	Dryland Farming and Watershed Management	2	0	1	3	3(2+1)
			Total	8	0	4	12	12(8+4)
			Minor Courses					
5	PEC	APP 501	Principles of Plant Physiology	2	0	1	3	3(2+1)
			Total	2	0	1	3	3(2+1)
			Supporting Courses					
6	PSC	STAT511	Experimental design	2	0	1	3	3(2+1)
			Total	2	0	1	3	3(2+1)
			Non-Credit Compulsory Cour	ses	•			
7	NC	PGS503	Intellectual Property and Its management in Agriculture	1	0	0	1	1(1+0)
8	NC	PGS504	Basic Concepts in Laboratory Techniques	0	0	1	1	1(0+1)
			Total	1	0	1	2	2(1+1)
			Grand Total	13	00	07	20	20(13+7)



Faculty of Agriculture Science and Technology

Department of Agronomy
Semester wise Structure Curriculum
(L= Lecture, T= Tutorial, P= Practical & H = Hours per week)

SEMESTER-III

S.N.	Category	Code	Course Title	L	T	P	Total H	Credits
			Research /Project work / S	Semina	r			
1	PRC	Agron 591	Master's Seminar	0	00	15	15	15(0+15)
2	SC	Agron 599	Master's Research	1	00	00	01	1(1+0)
			Seminar					
			Total	1	00	15	16	16(1+15)
			Non-Credit Compulsory C	ourses	•			
3	NC	PGS 505	Agricultural Research,	1	0	0	1	1(1+0)
			Research Ethics and Rural					
			Development					
			Programmes					
			Total	01			1	1(1+0)
			Grand Total	02	00	15	17	17 (2+15)



Faculty of Agriculture Science and Technology

Department of Agronomy

Semester wise Structure Curriculum (L= Lecture, T= Tutorial, P= Practical & H = Hours per week) SEMESTER-IV

S.N.	Category	Code	Course Title		T	P	Total H	Credits
1	SC	Agron 599	Master's Research Seminar	0	00	15	15	15(0+15)
			Total	00	00	15	15	15(0+15)
			Grand Total					74 (31+43)



Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code: Agron - 501 (3+0)

Course Title: Modern Concept in Crop Production

Pre-requisite: Before start of course classes student required sound knowledge in respect of basic principles of

agronomy, precesion farming and natural farming hypothesis for the purpose of increasing

crop production to fulfil the supply of food.

Rationale: This course has impact to increase the knowledge of PG students of agronomy by which they

will become as master towards adopting modern crop production techniques for enhance the

Course crop productivity with ceo-friendly environment. **Outcomes:**

Agron 501.1 Impart the modern concepts of crop production including tillage, optimization of plant growth population and planting geometry.

Agro 501.2 Discuss about growth regulators and their role in agriculture with plant nutrition and disease tolerance in field crop.

Agro 501.3 Implementation and recognition of organic farming with the concept of ideal plant types

Agro 501.4 Describe the impact of latest crop management practices on crop productivity and resource use efficiency.

Agro 501.5 Analyzing the crop growth analysis along with crop modelling in precision farming.

Scheme of Studies:

Board of Study	Course	se			Scheme of studies (Hours/Week)					
	Code	Course Title	Cl	LI	SW	SI	Total Study	Credits		
							Hours(CI+LI+SW+SL)	(C)		
Program core	AGRO 501	Modern concept in crop	3	0	1	1	5	3		
(SDGS)		production								

Legend: CI: Class room Instructions (Includes different instructional strategies i.e. Lecture(L), Tutorial (T) and

others).

LI: Laboratory Instruction (Includes Practical performance sin laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure out come of Learning.

Scheme of Assessment:

Theory

•			Scheme of A	Assessment (Marks)					
			Progressive	Assessment	(PRA)				End	
Board of Study	Course Code	Course Title	Class/Hom e Assignment 5 number	Class Test 2 (2 best out		<i>-</i>	Class Attendan	Marks	Semester Assessmen t	Total Marks (PRA+
			3 marks	of 3)10 marks each (CT)	(SA)	(CAT	(AT)	(CA+CT+ SA+CAT+ AT)	(ESA)	ESA)
Program core (SDGS)	AGRO 501	Modern concept in crop producti on	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Sessional Work (SW), and Self-Learning (SL). Which students are familiar through various mode of instruction .As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Agro- 501.1 Students will acquaint familiar with the knowledge of Cropping systems physical resources, soil and water management in cropping systems.

Approximate Hours

Item	Appx Hrs.
CI	05
LI	00
SW	01
SL	01
Total	07

Session Out comes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 SO1.1To brought		Unit-1 .Crop growth analysis in	
knowledge in crop		relation to environment agro-	o Gain knowledge about N-
production technology in		ecological zones of India	yield inverse law
relation to crop growth &		1.1. Give introductory remark	The assessment of crop growth
development		in crop production	analysis
			Prepare a map of crop zone of
SO1.2 To gain knowledge about		1.2 Introduce students about	M.P.
crop zones of M.P.		crop growth	
		1.3 To obtain best efforts in	
SO1.3To impart subject back		relation to precision	
ground		farming	
SO1.4. To understand different		1.4 To explain in details	
agro-ecological zones of		information about A.E. Zones	
India		1.5 Factor affecting crop	
		growth &	
		development	

SW-1 Suggested Sessional Work (SW):

Assignments: Enlist in detail- Agro-ecological zones of India, Agro climatic zones.

a. Other Activities(Specify): Field activities

Agron501.2 students will able to acquaints knowledge about Concept of sustainability agriculture and modern crop production technology.

Approximate Hours

Item	AppxHrs.
CI	05
LI	00
SW	03
SL	02
Total	10

Session Out comes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Student know very well		Unit-2 Quantitative agro biological	1. How to prove
about biological plough.		principles and inverse yield nitrogen	the law of
SO1.2 knowledge gain about		law mischerlich yield equation. Its	diminishing
baul unit		interpretation and applicability,	return
SO1.3 Understand the law of		Baule unit.	2.Prepare a
diminishing return		1.1 To teach the details of modern	report with
SO1.4 .Express the inverse yield		crop production technology	suitable
N Law & its applicability		1.2 Introduction of biological plough crops	figure.
SO1.5 . Deals mischerlich law to		& its practices.	3. Details study
understand the phosphorus		1.3 Study of inverse yield N law.	of biological
availability.		1.4 Details instruction about use of Baul	plough
		unit.	

1.5 Introductory information of Mischerlich	-
equation	

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare a suitable figure to indicate the biological plough technique

b. Other Activities (Specify): Research on most suitable modern crop production technology

Agron501.3 students will able to identify the interactions and interpretation under different scientific method.

Approximate Hours

Item	AppxHrs.
CI	05
LI	00
SW	01
SL	01
Total	07

Session Outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 Student will		Unit-3 Effect of lodging in cereals;	
become to gain		physiology of grain yield in cereals;	1. To prepare
knowledge about		optimization of plant population and planting	lodging
lodging in cereals		geometry in relation to different resources,	strategies
and its facts.		concept of ideal plant type and crop	2. Prepare a chart
SO1.2 Knowledge about		modeling for desired crop yield.	for modern
physiology of		Objectives: To teach the details of lodging,	crop production
grain yield in		plant geometry and concept of plant types for	technology.
cereals.		higher yield.	3. To find out the
SO1.3 Students acquired			best level of
knowledge in		1.1 Introduction of lodging	study
relation to plant		1.2 Study of crop physiology terms.	individually
population and		1.3 Study of difference between plant	
geometry		population and plant geometry	
SO1.4 .Express the		1.4 Crop modeling for enhance crop	
concept of ideal		productivity.	
plant type		1.5 Details instruction about resource	
SO1.5 Deals difference		generation by natural farming	
between crop			
modeling and ideal			
plant type for			
desired crop yield			

SW-1 Suggested Sessional Work(SW):

Assignments: To prepare a chart for modern crop production technology with principles and practices for the purpose of sustainable yield

c. Other Activities(Specify): New research work assigned for students to develop innovation

Agron501.4 students will able to acquaints knowledge for crop production technology, measure for control of crop lodging

Approximate Hours

rippi oximute riours								
Item	Appx Hrs.							
CI	05							
LI	00							
SW	01							
SL	01							
Total	07							

Session Outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 Students will become to		Unit-4 Scientific principles of crop production;	1.Student advice to
know Scientific		crop response production functions; concept of	detail study soil
principles of crop		soil plant relations; yield and environmental stress,	plant water
production		use of growth hormones and regulators for better	relationship
SO1.2 Student acquired		adaptation in stressed condition.	2. Prepare report on
knowledge about crop			crop response
response function		1.1 To Teach the Scientific principles of crop	production function
SO1.3 Understand the concept		production	3. Student directed to
of soil plant relations		1.2 To study of concept of soil plant relations	make a chart for
		1.3 Introductory information brought to amongst	Scientific principles
SO1.4 .Express knowledge		the students use of growth hormones	of crop production
about use of growth		1.4 Detail information acquired to students for	
hormones and		better adoption of growth regulators.	
regulators		1.5 Detail knowledge in relation to yield and	
SO1.5 Student acquainted		environmental stress	
knowledge in relation			
to yield and			
environmental stress			
and concept of soil			
plant relations			

SW-1 Suggested Sessional Work(SW):

Assignments: What is crop production technology, definition of agronomy and its importance, detail information about production functions?

d. Other Activities (Specify): Detail study of soil plant water relationship

Agro501.5PG students will become expert in crop production technology and use of plant growth regulators and their role in crop production.

Approximate Hours

Item	Appx Hrs.
CI	05
LI	00
SW	01
SL	01
Total	07

Session outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
so1.1 Knowledge brought to the students in respect of integrated farming system so1.2 Students will become to know very well about organic farming, and resource conservation technology so1.3 Student know the constraints of dry farming and WHT so1.4. They understand as a familiar precision		 Unit-5- Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage dry farming determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture. Modem crop production concepts: soil less cultivation, Aeroponic, Hydroponic, Robotic and terrace farming. use of GIS, GPS and remote sensing in modem agriculture, precision farming and protected agriculture. 1.1 Introduce about integrated farming system. 1.2 Study in details tillage and nutrient need of corp. 1.3 Detail instruction about different cultivation technique 	 Prepare a list Integrated farming systems Detail study of WHT. To get and prepare a project about concept of balance nutrition
agriculture e.g. GIS, GPS and remote sensing SO1.5. Students will become to know protected agriculture		 1.4 Introductory information in regard to remote sensing and use of drown technology 1.5 Detail in protected agriculture 	

SW-1 Suggested Sessional Work(SW):

Assignments: Integrated farming systems as a project report, organic farming technology including modern concept of tillage

e. Other Activities (Specify):Use of remote sensing, drown technology besides knowledge gain in regards of GIS and GPS etc.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lectu re (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+LI+ SW+Sl)
Agro 501 Impart the modern concepts of crop production including tillage, optimization of plant growth population and planting geometry	` /	00	01	01	07
Agro 501.2 Discuss about growth regulators and their role in agriculture with plant nutrition and disease tolerance in field crop.	05	00	03	02	10
farming with the concept of ideal plant types	05	00	01	01	07
Agro 501.4 Describe the impact of latest crop manageme practices on crop productivity and resource use efficiency.	05	00	01	01	07
Agro 501.5 Analyzing the crop growth analysis along with crop modelling in precision farming.	05	00	01	01	07
Total Hours	25	00	07	06	38

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles		Marks	Total	
		R	U	A	Marks
CO-1	Crop growth analysis in relation to environment agro- ecological zones of India	07	02	02	11
CO-2	Quantitative agro biological principles and inverse yield nitrogen law mischerlich yield equation. Its interpretation and applicability, Baule unit.	05	02	02	09
CO-3	Effect of lodging in cereals; physiology of grain yield in cereals; concept of ideal plant type and crop modelling for desired crop yield.	07	02	02	11

CO-4	Scientific principles of crop production yield and environmental stress, use of growth hormones and regulators for better adaptation in stressed condition.	05	02	02	9
	Integrated farming systems, modern concept of tillage use of GIS, GPS and remote sensing in modem agriculture, precision farming and protected agriculture.		02	01	10
Total		31	10	09	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Modern Concept in Crop Production will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above asks. Teachers can also design different task sapper requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Visitto cement plant
- 7. Demonstration
- 8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming.

Suggested Learning Resources:

(a)Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Principles and practices of agronnomy.	Balasubramaniya n p & palaniappan sp.	Agronbios	2001.
2	Reddy sr	Principles of crop production.	Kalyani publ	2000
3	Principles and practices of agronnomy	•	Kalyani publ	2006.

Curriculum Development Team

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Cos, POs and PSOs Mapping Course Code:-Agron- 501 Course Title: - Modern concept in crop Production

Course	ourse Program Outcomes									Program S	pecific Outco	ome		
Outcomes	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create	Student	Student	Understa	Enable to	Acquaintin	То	Apply	То
	knowledg	knowle	knowled	appr	ed	, select	will	will apply	nd the	recognize	g with	undertake	researc	underst
	e of	dge in	ge	opri	know	and	apply	basic	impact of	and .	basic	teaching	h and	and and
	various	the	regardin	ate	ledge	apply	various	concepts	the	examine	concepts	research	experti	analyze
	branches	concer	g	scie	of	an	statistic	in	professio	the	theories	and	se in	the
	of	ning	package	ntifi	cultiv	approp	al	laboratory	nal expert	relationshi	and	extension	resolvi	current
	agronomy	subject	and	С	ation	riate	method	techniques	solutions	ps	terminolog	activates	ng the	issues
	will be	which	practice	met	practi	techni	s to	during	in	between	y of	along with	proble	that are
	made	will	s soil	hod	ces,	ques,	analyze	their	societal	inputs and	Agronomy.	administrat	ms of	occurrin
	specialize	improv	fertilizer	S	soil,	resour	their	research	and .	outputs in		ive and	existin	g in
	d and to	e the	and	coll	fertili	ces	master	work	environm	their		consultanc	g farm	local
	provide	farmers	water	abor	zers,	and	researc		ental	agricultur		y services.	in the	and
	knowledg	conditi	manage	atio	water	moder	h work		contexts,	al field to			periph	global
	e	on	ment of	n	mana	n it			and	make			ery of	agricult
	disseminat	throug	producti	with	geme	tools			demonstr	effective			univer	ure and
	ion	h .	ve crop	stati	nt and	in			ate the	and			sities.	how
	regarding	student	aspects.	stics	plant	impro			knowledg	profitable				they
	various	's		alon	prote	vemen			e of, and	decisions.				will
	technique	contrib		g	ction	t of			need for	То				affect
	of farming	utions.		with	econo	agrono			sustainabl	understan				futuristi
	and			eval	mic .	mical			e	d the				C . 1.
	farming			uati	associ	packag			developm	mechanics				agricult
	system in			on	ated	e and			ent in	of agri				ure
	India			whi	with	practic			Agricultu	Entrepren				
				ch	farmi	es.			re.	eurship.				
				will	ng									
				prov	enter									
				ed	prises									ĺ

				to deci sion in vari ous part of agri cult ure										
CO1-Impart the modern concepts of crop production including tillage, optimization of plant growth population and planting geometry.	3	2	3	1	3	3	1	1	3	3	1	2	3	1
CO2 Discuss about growth regulators and their role in agriculture with plant nutrition and disease tolerance in field crop.	3	3	3	1	3	3	1	1	3	3	1	3	2	1

CO3 Implementatio n and recognition of organic farming with the concept of ideal plant types.	3	2	1	3	2	3	1	1	3	3	2	2	1	2
CO 4 Describe the impact of latest crop management practices on crop productivity and resource use efficiency.	3	2	1	3	1	3	1	1	1	3	1	3	2	1
Analyzing the crop growth analysis along with crop modelling in precision farming.	3	1	2	3	1	3	1	1	1	2	3	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Modern concept in crop Production

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1-Impart the modern concepts of crop production including tillage, optimization of plant growth population and planting geometry.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1.Crop growth analysis in relation to environment agro- ecological zones of India 1.1, 1.2,1.3,1.4,1.5.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2 Discuss about growth regulators and their role in agriculture with plant nutrition and disease tolerance in field crop.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-2 Quantitative agro biological principles and inverse yield nitrogen law mischerlich yield equation. Its interpretation and applicability, Baule unit 1.1, 1.2,1.3,1.4,1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 Implementation and recognition of organic farming with the concept of ideal plant types.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-3 Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modeling for desired crop yield. 1.1, 1.2,1.3,1.4,1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 Describe the impact of latest crop management practices on crop productivity and resource use efficiency.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit 4 Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress, use of growth hormones and regulators for better adaptation in stressed condition. 1.1, 1.2,1.3,1.4 1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12	CO5 Analyzing the crop growth analysis along with crop	SO1.1 SO1.2		Unit 5 Integrated farming systems, organic farming, and resource conservation	As mentioned in page number

	modelling in precision	SO1.3	technology including modern concept of
PSO 1,2, 3, 4, 5	farming.	SO1.4	tillage dry farming determining the nutrient
		SO1.5	needs for yield potentiality of crop plants,
		5510	concept of balance nutrition and
			integrated nutrient management; precision
			agriculture.
			Modem crop production concepts: soil less
			cultivation, Aeroponic, Hydroponic,
			Robotic and terrace farming. use of GIS,
			GPS and remote sensing in modem
			agriculture, precision farming and protected
			agriculture.
			1.1, 1.2,1.3,1.4 1.5



Faculty of Agriculture Science and technology
Department of Agronomy
Curriculum of M.Sc.(Ag)Agronomy Program

Course Code: Agron -501

CourseTitle: Principles And Practices Of Soil Fertility and Nutrient

Management

Pre-requisite: Student should have basic knowledge of soil fertility and nutrient

management, Principles, and concept of sustainable agriculture. Organic farming system and Nutrient use efficiency and fertility

status in the soil.

Rationale: The students should be acquainted with the knowledge of soil fertility and

nutrient management. They are involved in sustainable agriculture as they to maintain soil fertility and physical condition too and to prevent pests and diseases further the also maintain the ecological balance, and ensure efficient use of resources such as water and nutrients. This field of study and practice is driven by several key factors and considerations: Safety

,Sustainability,

Innovation and technology, Economic efficiency.

Course Outcomes:

Agron501.1To impart knowledge of fertilizer and nutrient and nutrients status of PGstudents.

Agron501.2To acquaint skillness towards application of organic manures for pushing up the production in natural farming

Agron501.3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.

Agron501.4 To judge the fertility status in the soil by students.

Agron501.5 To categorize the fertilizers in different groups as per availability of nutrients elements e.g. single, double and multiple nutrients container.

SchemeofStudies:

Board					Sche	Schemeofstudies(Hours/Week)			
ofStud y	Cours e Code	CourseTitle	Cl	LI	SW	SL	Total StudyHours(CI+ L I+SW+SL)	its (C)	
Program Core (SDGs)	AGRO- 501	Principles and PracticesofSoil Fertility and Nutrient Management	3	1	1	1	6	3	

 $\textbf{\textbf{Legend:}} \qquad \textbf{\textbf{CI:}} Class room Instruction (Includes different instruction alst rate gies i.e. Lecture (L) and Tutorial$

(T)andothers),

LI:LaboratoryInstruction(IncludesPracticalperformancesinlaboratoryworkshop,fieldorotherlocatio nsusing different instructional strategies)

SW:SessionalWork(includesassignment,seminar,miniprojectetc.),

SL:SelfLearning,

C: Credits.

 $\textbf{Note:} \quad SW\&SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome$

of Learning.

SchemeofAssessment:

Theory

		C CourseTitl	SchemeofAssessment(Marks)							
	Cou seC ode		ProgressiveAssessment(PRA)							Total Mark
Boardof Study			Class/ Home Assig nment 5num ber3 marks each(ClassT est2 (2 bestout Of3) 10mar kseach (CT)	Semina rone	sAct ivity anyo ne	Class Attendance (AT)	TotalMarks (CA+CT+SA+C AT+AT)	r Assessm ent	(PRA +
		D: :1	CA)			(CAT)			(ESA)	ESA)
Progra m Core (SDGs)	Agro- 501	Principle s and Practices of Soil Fertility and Nutrient Manage ment	15	20	5	5	5	50	50	100

Course-CurriculumDetailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are Anticipated to accomplish through various modes of instruction including Classroom Instruction (CI),

Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Agron 501.1 To impart knowledge of fertilizer and nutrient and nutrients status of PG students.

ApproximateHours

Item	Appx Hrs.
Cl	4
LI	4
SW	1
SL	2
Total	11

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self- Learning (SL)
SO1.1 Understand the soil fertility and productivity. SO1.2Understand the Soil Fertility and management system. SO1.3Understandthe Relationship between nutrient supply and crop growth. SO1.4Understand the organic farming.	1. Determination of soil pH and soil EC 2. Determination of soil organic C	Unit-1. Soil fertility and productivity - factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming – basic concepts and definitions. 1.1 Introduction to soil fertility and productivity and its factors affecting. 1.2 Indices and its features of good soil management. 1.3 Introduction relationship between nutrient supply and crop growth. Like nutrient upply all major and micro nutrients. 1.4 Explain the organic farming and	1. Soil fertility and productivity - factors affecting features of goodsoil management. 2. Organic farming- basic concepts and definitions.
		1.4 Explain the organic farming and its definition and concept.	

 $SW-1 Suggested Sessional Work (SW): \\ Assignments$

What is Soil fertility and productivity? definition, in dices and its importance and its management in soil fertility and nutrient status.

a. OtherActivities(Specify):

Research on study soil analysis of physical chemical and biological properties for the Satna Region.

Agron511.2 To acquaint skillness towards application of organic manures for pushing up the production in natural farming.

Item	AppxHrs.
Cl	6
LI	2
SW	1
SL	1
Total	12

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self- Learning (SL)
sol.1Understand the Criteria of essential nutrients and its their functions. sol.2 Understand the classification and nutrient deficiency symptoms under major and micro nutrients. sol.3 Understand the Transformation and dynamics of major plant nutrients in the soil Like Carbon, hydrogen and oxygen are mainly obtained from water and air. sol.4.Understandthe Transformation like Nitrogen, Phosphorus, Potassium etc. sol.5Understandthesoiland water management	Determination of available in, p, k and s of soil	Unit-2 Criteria of essentiality of nutrients; Essential plant nutrients – their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients. 1.1 Introduction to Concept and Criteria of essential nutrients sustainability in Soil Fertility and Nutrient Management. 1.2 Scope and Objectives of Soil Fertility and Nutrient Management 1.3. production potential under Transformation and dynamics of major plant nutrients in the soil. 1.4 Production potential under Transformation like Nitrogen, Phosphorus, Potassium 1.5 Introduction to soil fertility and productivity and its advantages. 1.6 Mechanism of yield advantage in management of soil fertility and	and farming systems.

Assignments:

Concept in Criteria of essential nutrients systems and farming systems, scope and Objectives production potential under Principles and Practices of Soil Fertility and Nutrient Management.

OtherActivities(Specify):

Research on study soil analysis of physical chemical and biological properties for the Satna Region.

Agron501.3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.

Item	AppxHrs.
Cl	6
LI	2
SW	1
SL	1
Total	10

SessionOutcome s (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self- Learning (SL)
SO1.1Understand the Crop Diversification for sustainability SO1.2 Understand the organic farming and role of organic farming to maintain soil Fertility SO1.3Understandthecropresidue management; fertilizer use efficiency. SO1.4. Understand the organic concentrates their composition, availability, and cropresponses. SO1.5Understandtherecyclingof organic wastes and residue management.	Determination of soil organic carbon	Unit-3 Preparation and use of farmyard manure, compost, green manures, vermicompost, iofertilizers and other organic oncentrates their composition, vailability and cropresponses; ecycling of organic wastes and esidue management. Soil less ultivation. 1.1 IntroductiontoCrop diversification. 1.2 Introduction to organic Farming and its effects on crop and soil. 1.3 Introduction to organic Farming and its role in sustainable agriculture and to maintain soil Fertility 1.4 Role of organic concentrates their composition, availability and crop responses. 1.5 Role of non-monetary Inputs and low cost technologies. 1.6 New research need on Sustainable agriculture and new innovation on sustainable agriculture.	1.Study on allelopathic effect on crop and new research on sustainable agriculture.

Assignments:

Role of non-monetary Inputs and low cost technologies; research need on sustainable agriculture

b. OtherActivities(Specify):

NewResearchonsustainable agriculture

Agron501.4 To judge the fertility status in the soil by students.

Item	AppxHrs.
Cl	5
LI	2
SW	1
SL	1
Total	9

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self-Learning (SL)
SO1.1 Understand Commercial fertilizers; composition, relative fertilizer value and cost. SO1.2Understand the different nutrients, residual effects and Fertilizer use efficiency. SO1.3Understandthecropresidue management; fertilizer use efficiency. SO1.4. Understand the fertilizer Use in intensive cropping system. SO1.5Understandtheadvanced Nutritional tools for big data analysis and interpretation.		Unit-4 Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency; agronomic, chemical and physiological, fertilizer mixtures and grades; methods of increasing fertilizer use efficiency; nutrient interactions. 1.1 IntroductiontoCommercial fertilizers. 1.2 diversification of crop and its importance for sustainability. 1.3 Introduction to organic farming and its role in Sustainable agriculture and to maintain soil Fertility 1.4 Introduction to management of crop residue and nutrient use efficiency. 1.5 The fertilizer methods of increasing fertilizer use Efficiency ;nutrient interactions.	diversification and Importance of organic farming for the sustainable agriculture.

Assignments:

Crop diversification for sustainability; role of organic matter in the maintenance of soil Fertility; crop residue management; fertilizer use efficiency

c. OtherActivities(Specify):

Research on nutrient use efficiency.

Agron501.5 To categorize the fertilizers in different groups as per availability of nutrientselementse.g. single, double and multiple nutrients containers.

Item	AppxHrs.		
Cl	4		
LI	2		
SW	1		
SL	1		
Total	8		

SessionOutcomes	Laboratory	ClassroomInstruction	Self-
(SOs)	Instruction	(CI) Learning	
(BOS)	(LI)	(CI)	(SL)
SO1.1 Understand the Time and	Computation	Unit-5 Time and methods of	
methods of manures and fertilizers	of optimum	manures and fertilizers	
	and economic	application; foliar	manures and
SO1.2UnderstandthePlantfoliar	yield	Application and its concept;	
application and its concept	J-5-2	relative performance of	TOTOTIZOIS
		organic and inorganic	
SO1.3Understandtheorganicand		nutrients; economics of	
inorganic nutrients		fertilizer use ;integrated	
		nutrient management ;use of	
SO1.4 .Understand the plant		vermicompost and residue	
growth, use of vermicompost and		wastes in crops.	
residue wastes in crops.			
		1.1 Time and methods of manures	
		and fertilizers	
		1.2 Introduction to Plant	
		foliar application and its	
		concept.	
		1.3 Introduction to organic and In	
		organic nutrients	
		1.4 Introduction to the plant growth	
		regulator and their	
		Role in sustainability	

Assignments: Understand the Time and methods of manures and fertilizers and their role in sustainability

d. OtherActivities(Specify):

Study on Time and methods of manures and fertilizers and their role in sustainability.

Brief of Hours suggestedf or the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instructi on (LI)	Sessiona 1 Work (SW)	Self Learnin g (Sl)	Totalhour (Cl+LI+SW +Sl)
Agron501.1 To impart knowledge of fertilizer and nutrient and nutrients status of PGstudents.	4	4	1	2	11
Agron501.2 To acquaint skillness towards application of organic manures for pushing up the production in natural farming	6	2	1	1	10
Agron501.3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.	6	2	1	1	10
Agron501.4 To judge the fertility status in the soil by students.	5	2	1	1	9
Agron501.5 To categorize the fertilizers in different groups as per availability of nutrients elements e.g. single, double and multiple nutrients container	4	2	1	1	8
TotalHours	25	12	5	6	48

Suggestion for End Semester Assessment

CO	O UnitTitles		arks Dis	tribution	Total
		R	U	A	Marks
CO-1	Unit-1. Soil fertility and productivity - factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming—basic concepts and definitions.	03	01	01	05
CO-2	Unit-2Criteria of essentiality ofnutrients; Essential plant nutrients their functions, nutrient deficiency symptoms; Transformation and dynamics of major plant nutrients.	02	06	02	10
CO-3	Unit-3 Preparation and use of farmyard manure, compost, green manures, vermicompost, Biofertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management. Soil less cultivation.	03	07	05	15
CO-4	Unit-4 Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency; agronomic, chemical and physiological, fertilizer mixtures and grades; methods of increasing fertilizer use efficiency; nutrient interactions.	-	10	05	15
CO-5	Unit-5 Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic nutrients; economics of fertilizer use; integrated nutrient management; use of vermicompost and residue wastes in crops.	03	02	-	05
	Total	11	26	13	50

Legend: R:Remember, U:Understand, A:Apply

 $The end of semester assessment for Principles and practices of so il fertility and nutrients \ management \ will \ be \ held \ with \ written \ examination \ of \ 50 \ marks$

Note .DetailedAssessmentrubricneedtobepreparedbythecoursewiseteachersforabovetasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. ImprovedLecture
- 2. Tutorial
- 3. CaseMethod
- 4. GroupDiscussion
- 5. RolePlay
- 6. Visittofield
- 7. Demonstration
- 8. ICTBasedTeachingLearning(VideoDemonstration/TutorialsCBT, Blog,Facebook,Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming

Suggested LearningResources:

(a)Books:

	DOOKS:			
S. No.	Title	Author	Publisher	Edition& Year
1	The nature and propertiesofsoils	bradyncandweil rr	13thed.Pearson edu.	2002
2	Growthandmineral nutrition of field crops.	fageriank, baligarvcand jones ca	Marceldekker.	1991
3	Soilfertilityand fertilizers. 7th	havlinjl, beatonjd, tisdalesland nelson wl.	-	2006
4	Soil fertility managementfor sustainable agriculture	prasadrand power jf	CrcPr ess.	1997
5	Manuresand fertilizers	yawalkarks, agrawaljpandbokd e s	Agri-hortipubl.	2000

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Cos, POs and PSOs Mapping Course Code:-Agron- 501

Course Title: -Principles and Practices of Soil Fertility and Nutrient

Program Specific Outcome

Course	Program O	Outcomes								Program S	pecific Outco	ome		
Outcomes	PO1	PO2	PO3	PO	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
				4										
	Specific	Wide	Detailed	Use	Detail	Create	Student	Student	Understa	Enable to	Acquaintin	То	Apply	То
	knowledg	knowle	knowled	appr	ed	, select	will	will apply	nd the	recognize	g with	undertake	researc	underst
	e of	dge in	ge	opri	know	and	apply	basic	impact of	and	basic	teaching	h and	and and
	various	the	regardin	ate	ledge	apply	various	concepts	the	examine	concepts	research	experti	analyze
	branches of	concer ning	g package	scie ntifi	of cultiv	an	statistic al	in laboratory	professio nal expert	the	theories	and	se in	the
	agronomy	subject	and	C	ation	approp riate	method	techniques	solutions	relationshi	and	extension	resolvi	current
	will be	which	practice	met	practi	techni	s to	during	in	ps	terminolog	activates	ng the	issues
	made	will	s soil	hod	ces,	ques,	analyze	their	societal	between	y of	along with	proble	that are
	specialize	improv	fertilizer	S	soil,	resour	their	research	and	inputs and	Agronomy.	administrat	ms of	occurrin
	d and to	e the	and	coll	fertili	ces	master	work	environm	outputs in		ive and	existin	g in
	provide	farmers	water	abor	zers,	and	researc		ental	their		consultanc	g farm	local
	knowledg e	conditi on	manage ment of	atio n	water mana	moder n it	h work		contexts,	agricultur		y services.	in the	and
	disseminat	throug	producti	with	geme	tools			demonstr	al field to			periph	global
	ion	h	ve crop	stati	nt and	in			ate the	make			ery of	agricult
	regarding	student	aspects.	stics	plant	impro			knowledg	effective			univer	ure and
	various	's		alon	prote	vemen			e of, and	and			sities.	how
	technique	contrib		g	ction	t of			need for	profitable				they
	of farming	utions.		with	econo	agrono mical			sustainabl	decisions.				will
	and farming			eval uati	mic associ	packag			e developm	То				affect
	system in			on	ated	e and			ent in	understan				futuristi
	India			whi	with	practic			Agricultu	d the				c
				ch	farmi	es.			re.	mechanics				agricult
				will	ng					of agri				ure
				prov	enter					Entrepren				
				ed to	prises					eurship.				
				deci	•					•				
				sion										
				in										
				vari										
				ous										
				part										
				of										
				agri cult										
				ure										

CO1- To impart knowledge of fertilizer and nutrient and nutrients status of PGstudents	1	3	3	1	2	1	3	3	3	3	1	2	3	1
CO2 To acquaint skillness towards application of organic manures for pushing up the production in natural farming	3	1	3	3	1	2	1	3	3	1	1	3	2	1
CO3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.		3	3	1	2	1	3	3	1	3	2	2	1	2

CO 4 To judge the fertility status in the soil by students.	3	2	1	3	1	3	1	3	3	1	2	1	3	1
CO5 To categorize the fertilizers in different groups as per availability of nutrients elements e.g. single, double and multiple nutrients container	3	1	2	1	3	3	1	1	2	1	3	1	3	1 3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map:Principles and Practices of Soil Fertility and Nutrient

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- To impart knowledge of fertilizer and nutrient and nutrients status of PGstudents	SO1.1 SO1.2 SO1.3 SO1.4	Instruction(LI)	Unit-1.Soil fertility and productivity - factors affecting; featuresofgoodsoilmanagement; problemsofsupplyand availability of nutrients; relation between nutrient supply andcropgrowth; organic farming—basic concepts and definitions. 1.1, 1.2, 1.3, 1.4	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2 To acquaint skillness towards application of organic manures for pushing up the production in natural farming	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-2 Criteria of essentiality ofnutrients;Essential plant nutrients—theirfunctions,nutrientdeficiencysymptoms; Transformationanddynamicsofmajorplantnutrients. 1.1, 1.2,1.3,.4,1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-3Preparation and use of farmyard manure, compost, green manures, vermicompost, Biofertilizers and other organic concentrates their composition, availabilityandcropresponses;recyclingof organic wastes and residue management. Soil less cultivation. 1.1, 1.2,1.3,1.4,1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 To judge the fertility status in the soil by students.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5SO1		Unit 4Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency; agronomic, chemical and physiological, fertilizer mixtures andgrades; methodsofincreasing fertilizer use efficiency; nutrient interactions. 1.1, 1.2, 1.3, 1.4 1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12	CO5 To categorize the fertilizers in different groups as	SO1.1 SO1.2 SO1.3		Unit 5 Time and methods of manures and fertilizers application; foliar application and its concept; relative	As mentioned in page number

PSO 1,2, 3, 4, 5	per availability of	SO1.4	performanceoforganicandinorganicnutrients;economics of	
	nutrients elements	so	fertilizer use; integrated nutrient management; use of	
	e.g. single, double		vermicompost and residue wastes in crops.	
	and multiple		1.1, 1.2,1.3,1.4	
	nutrients container			



AKS University

Faculty of Agriculture Science and Technology

Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code: Agron 506

Course Title: Agronomy of major cereals, pulses (2+0)

Pre-requisite: Student should have specific knowledge of crops, cultivation

practices and their management.

Rationale: The students should be acquainted with the knowledge of Crops and patterns refer to the

types and sequences of crops that are grown. They are involve in sustainable agriculture as they to maintain soil fertility and physical condition too and to prevent pests and diseases further the also maintain the ecological balance, and ensure efficient use of resources such as water and nutrients. This field of study and practice is driven by several key factors and considerations: Safety, Sustainability, Innovation and

technology, Economic efficiency.

Course Outcomes:

Agron 506.1 pg students of agronomy will become expert and determine crop husbandry of cereals and pulses crops.

Agron 506.2 pg students acquire knowledge towards nutrition of crops and its quality to develop architectural characteristics.

Agron 506.3 student may become expert in processing technology of cereals and pulses to increase value.

Agron 506.4 students will able to become expert for resolving the problems of soil, water and nutrient status.

Agron 506.5 students may acquaint to examine the different new varieties of cereals and pulses

Scheme of Studies:

0	Course Code				st		me of ours/Week)	Total Cred ts
course		Course Title	Cl	LI	SW	SL	Total Study Hours(CI +LI+SW+SL)	(C)
Progra m Core (PCCs)	0	Agronomy of major cereals, pulses	2	0	1	1	4	2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacherto ensure the outcome of Learning.

Scheme of Assessment:

Theory

						Schem	ne of Assessmo	ent (Marks)		
					Progres	ssive As	sessment (PR	A)	End Semest	Total Mark
Board of Study	e		Class/ Home Assig nmen t 5 numb er 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Semi nar one	Class Activ ity any one (CA T)	Class Attendance (AT)	Total Marks (CA+CT+SA+C AT+AT)	er Assess ment	Mark s (PRA + ESA)
Program Core (PCC)	Agro nn 506	Agronomy of major cereals and pulses.	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should

showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Agron 506.1 pg students of agronomy will become expert and determine crop husbandry of cereals and pulses crops

Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 pg students of agronomy will become expert SO1.2 Determine crop husbandry of cereals and pulses crops.		Unit 1 origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of wheat, barley, oat. 1.1 origin and history, area and production, classification,	 origin and history, area and production, classification,. improved varieties, adaptability, climate, soil, water

1.2 improved varieties, adaptability,	
1.3 climate, soil, water	
1.4 cultural requirements,	
1.5 nutrition, quality components,	
1.6 handling and processing of the produce for maximum production of wheat, barley, oat.	

Assignments:

What is Cropping systems? definition, indices and its importance and physical resources and its management in cropping system.

a. Other Activities (Specify):

Agron 506.2 pg students acquire knowledge towards nutrition of crops and its quality to develop architectural characteristics.

Item	Appx Hrs.
Cl	06
LI	0
SW	2
SL	1
Total	09

Session Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
SO1.1 pg students acquire knowledge towards nutrition of crops SO1.2 Its quality to develop architectural characteristics.		Unit 2 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of rice, maize, sorghum, pearlmillet, fingermillet. 1.1 Origin and history, area and production, classification, 1.2 improved varieties, adaptability, 1.3 climate, soil, water 1.4 cultural requirements, 1.5 nutrition quality components, 1.6 handling and processing of the produce for maximum production of rice, maize, sorghum, pearlmillet, fingermillet.	1. Origin and history, area and production, classification of rice. 2improved varieties, adaptability, climate of maize.

Assignments:

What is Cropping systems? definition, indices and its importance and physical resources and its management in cropping system.

b. Other Activities (Specify):Research on most suitable Cropping systems for the Satna Region.

Assignments:

Concept of sustainability in cropping systems and farming systems, scope and Objectives production potential under different cropping system.

c. Other Activities (Specify):

Research on most suitable intercropping for the Satna Region.

Agron 506.3 student may become expert in processing technology of cereals and pulses to increase value.

Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Student may become expert in processing technology of cereals and pulses to increase value. SO1.2 Student may become expert in processing technology of pulses to increase		Unit 3 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of pea, chickpea, lentil 1.1 Origin and history, area and production, 1.2 classification, improved varieties, adaptability, 1.3 climate, soil, water 1.4 cultural requirements, 1.5 nutrition, quality components, 1.6 handling and processing of the produce for maximum production of pea, chickpea, lentil	1. climate, soil, water and cultural requirement s of chickpea 2. handling and processing of the produce for maximum production of pea

Assignments:

Role of non-monetary Inputs and low-cost technologies; research need on sustainable agriculture

d. OtherActivities(Specify):

New Research on sustainable agriculture.

Agron 506.4 Students will able to become expert for resolving the problems of soil, water and nutrient status.

Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes(SOs)	Laboratory	Classroom Instruction(CI)	Self-
	Instruction		Learning
	(LI)		(SL)
SO1.1 students will able to		Unit 4	1. cultural
become expert for resolving the		Origin and history, areaand	requirements,
problems of soil, water		production,	nutrition and
GO1 2 G. 1		classification, improved	quality
SO1.2 Students will able to		varieties, adaptability,	components of
become expert for resolving the problems of nutrient status.		climate, soil, water and	pigeon pea.
problems of nutrient status.		cultural requirements,	
		nutrition, quality	2.Handling and
		components, handling	processing of
		and processing of the	the produce for
		produce for maximum	maximum
		production of green	production of
		gram, black gram, pigeon	green gram,
		pea.	black gram,
		4.1 Origin and history, area	
		and production,	
		4.2 classification, improved	
		varieties, adaptability,	
		4.3 climate, soil, water	
		4.4 cultural requirements,	
		4.5 nutrition and quality	
		components,	
		4.6 handling and processing	
		of the produce for maximum	
		production of green gram,	
		black gram, pigeon pea	

Assignments:

Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency

e. Other Activities(Specify):

Research on nutrient use efficiency

Agron 506.5 Students may acquaint to examine the different new varieties of cereals and pulses.

Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Out	tcomes(SOs)	Laboratory Instruction	Classroom Instruction	Self-Learning (SL)
		(LI)	(CI)	(SE)
problems of soi SO1.2 Students	for resolving the l, water swill able to for resolving the		Unit 4 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of green gram, black gram, pigeon pea. 1.1 Origin and history, area and production, 1.2 classification, improved varieties, adaptability, 1.3 climate, soil, water 1.4 cultural requirements, 1.5 nutrition and quality components, 1.6 handling and processing of the produce for maximum	1. cultural requirements, nutrition and quality components of pigeon pea. 2. Handling and processing of the produce for maximum production of green gram, black gram,

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory (LI)	Sessionl work (SW)	Self- Learnin g (Sl)	Total hour (Cl+SW+ Sl)
Agron 506.1 pg students of agronomy will become expert and determine crop husbandry of cereals andpulses crops.	5	0	1	1	08
Agron 506.2 pg students acquire knowledge towardsnutrition of crops and its quality to develop architectural characteristics.	6	0	2	1	09
Agron 506.3 student may become expert in processing technology of cereals and pulses toincrease value.	6	0	1	1	8
Agron 506.4 students will able to become expert forresolving the problems of soil, water and nutrient status.	6	0	1	1	8
Agron 506.5 students may acquaint to examine the different new varieties of cereals and pulses.	6	0	1	1	8
Total Hours	29	0	7	6	41

Suggestion for End Semester Assessment

CO Unit Titles			Marks Distribution				
		R	U	A	Mark s		
CO-1	Unit 1 origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of wheat, barley, oat.	08	03	02	13		
CO-2	Unit 2 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of rice, maize, sorghum, pearlmillet, fingermillet.	08	04	02	12		
CO-3	Unit 3 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of pea, chickpea, lentil	07	03	02	12		
CO-4	Unit 4 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of green gram, black gram, pigeon pea.	08	02	03	13		
Total		29	12	09	50		

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to principles and practices of organic farming will beheld with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for abovetasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Visit to farm/ field
- 6. Demonstration

Suggested Learning Resourcese

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Science of field crop production.	hunsigi g and krishna kr.	Oxford & ibh.	1998.
2	.Advances in pulse production technology.	jeswani lm and baldev b	icar	1997
3	Seed technology.	khare d and bhale ms.	Scientific publ	2000
4	Maize production in india:	kumar ranjeet and singh np	golden grain in transition	2003

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- 4. Dr. D. P. Chaturvedi, Assistant Professor, Dept. of Agronomy, FAST
- 5. Dr. P. K. Bagri, Assistant Professor, Dept. of Agronomy, FAST
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Cos, POs, and PSOs Mapping Course Code:-Agron-506

Course Title: - Agronomy Of Major Cereals, Pulses

Course	Program O	utcomes								Program Sp	ecific Outcom	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific knowledge	Wide knowle	Detailed knowled	Use appr	Detail ed	Create, select	Student will	Student will apply	Understan d the	Enable to recognize	Acquainting with basic	To undertake	Apply researc	To understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n 41	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various technique	through student'	producti	stics alon	ement and	improv			e the knowledge	and profitable			univers ities.	how they will
	of farming	Student	ve crop aspects.		plant	ement of			of, and	decisions.			ities.	affect
	and	contribu	aspects.	g with	protec	agrono			need for	To				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in	tions.		uatio	econo	packag			developme	the				re
	India			n	mic	e and			nt in	mechanics				
				whic	associ	practic			Agricultur	of agri				
				h	ated	es.			e.	Entreprene				
				will	with					urship.				
				prov	farmin									
				ed to	g									
				deci	enterp									
				sion	rises.									
				in										
				vari										
				ous										

				part of agric ultur e										
co1- pg students of agronomy will become expert and determine crop husbandry of cereals and pulses crops.	3	3	3	1	1	3	3	1	3	2	1	1	3	3
cO2 pg students acquire knowledge towards nutrition of crops and its quality to develop architectural characteristic s.	3	3	3	3	1	3	2	1	1	3	1	3	3	1
CO3 student may become expert in	3	2	3	1	3	1	3	3	2	1	1	2	3	2

processing technology of cereals and pulses to increase value.														
co 4 students will able to become expert for resolving the problems of soil, water and nutrient status.	3	2	1	1	3	3	2	1	1	3	1	3	2	3
students may acquaint to examine the different new varieties of cereals and pulses.	3	2	1	1	3	1	3	1	3	2	3	3	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Agronomy Of Major Cereals, Pulses

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- pg students of agronomy will become expert and determine crop husbandry of cereals and pulses crops.	SO1.1 SO1.2		Unit 1 origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of wheat, barley, oat. 1.1,1.2,1.3,1.4,1.5,1.6.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2 pg students acquire knowledge towards nutrition of crops and its quality to develop architectural characteristics.	SO1.1 SO1.2		Unit 2 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of rice, maize, sorghum, pearlmillet, fingermillet. 1.1,1.2,1.3,1.4,1.5,1.6.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 student may become expert in processing technology of cereals and pulses to increase value.	SO1.1 SO1.2		Unit 3 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of pea, chickpea, lentil 1.1,1.2,1.3,1.4,1.5,1.6.	As mentioned in page number

PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 students will able to become expert for resolving the problems of soil, water and nutrient status.	SO1.1 SO1.2	Unit 4 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of green gram, black gram, pigeon pea. 1.1,1.2,1.3,1.4,1.5,1.6.	As mentioned in page number
PO 1,2,3,4,5,6	CO5 students may	SO1.1	Unit 5 Origin and history, area and	As mentioned in page
7,8,9,10,11,12	acquaint to	SO1.2	production, classification, improved	number
PSO 1,2, 3, 4, 5	examine the		varieties, adaptability, climate, soil,	
150 1,2, 5, 4, 5	different new		water and cultural requirements,	
	varieties of cereals		nutrition, quality components, handling	
	and pulses.		and processing of the produce for	
			maximum production of green gram,	
			black gram, pigeon pea.	
			1.1,1.2,1.3,1.4,1.5,1.6.	



AKS University

Faculty of Agriculture Science and technology
Department of Agronomy
Curriculum of M.Sc Ag Agronomy Program

Course Code: Agron- 511 (2+0)

Course Title: Cropping systems and sustainable agriculture

Pre-requisite: Student should have basic knowledge of cropping system, concept

of sustainable agriculture. Farming system and its types and

Nutrient use efficiency and Ideotype concept.

Rationale: The students should be acquainted with the knowledge of Cropping

systems and patterns refer to the types and sequences of crops that are grown. They are involve in sustainable agriculture as they to maintain soil fertility and physical condition too and to prevent pests and diseases further the also maintain the ecological balance, and ensure efficient use of resources such as water and nutrients. This field of study and practice is driven by several key factors and considerations: Safety, Sustainability, Innovation and technology,

Economic efficiency.

Course Outcomes:

Agron 511.1Students acquaint will familiar with the knowledge of Cropping systems physical resources, soil and water management in cropping systems.

Agron 511.2 students will able to acquaints knowledge about Concept of sustainability in cropping systems and farming systems and types of cropping system and its advantages.

Agron 511.3 Students will able to identify the interactions and allelopathic effects; competition relations and become become expert in calculate the monetary returns

Agron 511.4Students will able to acquaint knowledge to Crop diversification, role of organic matter in maintenance of soil Fertility, crop residue management and nutrient use efficiency.

Agron 511.5PG students will become expert in Plant ideotypes for drylands plant growth regulators and their role in sustainability.

Scheme of Studies:

Category					Scheme of studies (Hours/Week)			Total Credits
of Course	Course	Course Title	Cl	LI	SW	SL	Total Study Hours(CI+LI+SW	(C)
	Code						+SL)	

Crop	ping systems (02	0	1	1	04	2
and	sustainable						
ag	griculture						

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture(L) and Tutorial (T) and others),

LI:Laboratory Instruction(Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure

outcome of Learning.

Scheme of Assessment:

Theory

						Sch	eme of Assessment	(Marks)		
					Progr	essive Asse	essment (PRA)		End Semester Assessm	Total Marks
Board of Study	Couse Code	Course Title	Class/H ome Assignm ent 5 number	Class Test 2 (2 best out of 3) 10 marks	Seminar one	Class Activit y any one	Class Attendance	Total Marks	ent	
			3 marks each (CA)	each (CT)	(SA)	(CAT)	(AT)	(CA+CT+SA+CAT+A T)	(ESA)	(PRA+ ESA)
Program Core (SDGs)	Agron- 511	Cropping systems and sustainable agriculture	10	40				50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Agron511.1Students acquaint will familiar with the knowledge of Cropping systems physical resources, soil and water management in cropping systems.

Item	Appx Hrs.
C1	05
LI	0
SW	1
SL	1
Total	07

Session Outcomes (SOs)	Laboratory Instruction	Classroom Instruction (CI)	Self- Learning
(505)	(LI)	(01)	(SL)
SO1.1Understand the Cropping		Unit-1.Cropping systems:	1. Cropping
systems.		definition, indices and its	system and
		importance; physical	know the
SO1.2 Understand the cropping		resources, soil	importance of cropping
system and farming		And water management in	system and
system. physical resources.		cropping systems;	management
SO1.3 Understand the physical		assessment of land use.	of resources.
resources like soil, water		1.1 Introduction to cropping	2. The assessment
etc.		system and its benefit.	of land use
			according to the
SO1.4 Understand the soil and		1.Indices and its importance	crop
water management in		calculate the different indices	
cropping system.			
		1.3 Introduction to physical	
		resources, soil and water.	
		1.4 Explain the soil	
		And water management	
		intercropping systems	
		1.5 introduction to assessment	
		of land use.	

SW-1 Suggested Sessional Work(SW): Assignments:

What is Cropping systems? definition, indices and its importance and physical resources and its management in cropping system.

a. Other Activities (Specify):

Research on most suitable Cropping systems for the Satna Region.

Agron511.2 students will able to acquaints knowledge about Concept of sustainability in cropping systems and farming systems and types of cropping system and its advantages.

Item	Appx Hrs.
Cl	08
LI	0
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
SO1.1 Understand the Concept of sustainability in cropping systems and farming systems.		Unit-2Concept of sustainability in cropping systems and farming systems, scope and Objectives; production potential	1.Concept of sustainability intercropping systems and
SO1.2Understand the scope and Objectives cropping systems and farming systems		under monoculture cropping, multiple cropping, Alley cropping, sequential cropping and intercropping,	farming systems in satna region. 2.Intercropping
SO1.3 Understand the production potential under monoculture cropping, multiple cropping potential under monoculture cropping, multiple cropping		mechanism of yield advantage In intercropping systems. 1.1Introduction to Concept of sustainability in cropping systems and farming systems	and its advantage and farmers are benefited from intercropping.
SO1.4.Understand the Alley cropping, sequential cropping and intercropping		1.2 Scope and Objectives of cropping systems and farming systems	
SO1.5 Understand the soil and water management in cropping system		1.3.production potential under monoculture cropping, multiple cropping	
•		1.4 production potential under multiple cropping.	
		1.5 production potential under Alley cropping	
		1.6 production potential under sequential cropping	
		1.7 Introduction to intercropping and its advantages.	
		1.8 Mechanism of yield advantage in intercropping systems.	

Assignments:

Concept of sustainability in cropping systems and farming systems, scope and Objectives production potential under different cropping system.

b. Other Activities (Specify):

Research on most suitable intercropping for the Satna Region.

Agron511.3 Students will able to identify the interactions and allelopathic effects; competition relations and become become expert in calculate the monetary return.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
SO1.1 Understand the Above and	(121)	Unit-3 Above and below ground	1. Study on
below ground interactions		interactions and allelopathic	allelopathic
below ground interactions		effects; competition relations;	effect on crop
SO1.2 Understand the allelopathic		Multi-storied cropping and	and new
effects of weed on crop, weed on		yield stability in intercropping,	research on
crop and crop on weed		role of non-monetary	sustainable
crop and crop on weed		Inputs and low cost	agriculture.
SO1.3 Understand the competition relations between plants and Multi-storied cropping and		technologies; research need on sustainable agriculture.	C
yield stability in intercropping		1.1 Introduction to above and	
jeen statement in anti-triple		below ground interactions.	
SO1.4 .Understand the role of non-monetary Inputs and low cost technologies		1.2 Introduction to allelopathic and its effects on crop .	
SO1.5 Understand the research need on sustainable agriculture.		1.3 .Introduction to competitive relationship between crops.	
		1.4 .Multi-storied cropping and yield stability in intercropping	
		1.5 Role of non-monetary Inputs and low cost technologies.	
		1.6 New research need on sustainable agriculture and new innovation on sustainable agriculture.	

SW-1 Suggested Sessional Work(SW):

Assignments:

Role of non-monetary Inputs and low cost technologies; research need on sustainable agriculture

c. Other Activities (Specify):

New Research on sustainable agriculture

Agron511.4 Students will able to acquaint knowledge to Crop diversification, role of organic matter in maintenance of soil Fertility, crop residue management and nutrient use efficiency.

Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
 SO1.1Understand the Crop diversification for sustainability SO1.2 Understand the organic farming and role of organic farming to maintain soil Fertility SO1.3 Understand the crop residue management; fertilizer use efficiency. SO1.4.Understand the fertilizer Use in intensive cropping system. SO1.5Understand the advanced nutritional tools for big data analysis and interpretation. 		Unit-4 Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency and concept of fertilizer Use in intensive cropping system. Advanced nutritional tools for big data analysis and interpretation. 1.1Introduction to Crop diversification of crop and its importance for sustainability. 1.3.Introduction to organic farming and its role in sustainable agriculture and to maintain soil Fertility 1.4 Introduction to management of crop residue and nutrient use efficiency. 1.5 The fertilizer Use in intensive cropping system. 1.6 Advanced nutritional tools for big data analysis and interpretation.	1. Study on crop diversification and importance of organic farming for the sustainable agriculture.

SW-1 Suggested Sessional Work(SW):

Assignments:

Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency

d. Other Activities(Specify):

Research on nutrient use efficiency. .

Agron511.5PG students will become expert in Plant ideotypes for drylands plant growth regulators and their role in sustainability.

Approximate Hours

Item	Appx Hrs.
Cl	04
LI	0
SW	1
SL	1
Total	6

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
SO1.1Understand the Plant		Unit-5Plantideotypes for	1.Study on plant
ideotypes.		drylands; plant growth	ideotypes and
SO1.2 Understand the Plant ideotypes for drylands agriculture.		regulators and their role in sustainability.	growth regulators.
deotypes for drylands agriculture.		1.1Introduction toPlant	
SO1.3 Understand the plant growth regulators		ideotypes.	
		1.2.1Introduction toPlant	
SO1.4 . Understand the plant growth regulator and their role in sustainability.		ideotypes for drylands agriculture.	
		1.3 .Introduction toplant growth regulators.	
		1.4 Introduction to the plant growth regulator and their role in sustainability	

SW-1 Suggested Sessional Work(SW):

Assignments: Plant ideotypes for drylands; plant growth regulators and their role in sustainability

e. Other Activities (Specify):

Study on plant growth regulators and their role in sustainability.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
Agron511.1Students acquaint will familiar with the knowledge of Cropping systems physical resources, soil and water management in cropping systems.	05	0	01	01	07
Agron511.2 students will able to acquaints knowledge about Concept of sustainability in cropping systems and farming systems and types of cropping system and its advantages	08	0	02	01	11
Agron511.3 Students will able to identify the interactions and allelopathic effects; competition relations and become become expert in calculate the monetary returns.	06	0	01	01	08
Agron511.4Students will able to acquaint knowledge to Crop diversification, role of organic matter in maintenance of soil Fertility, crop residue management and nutrient use efficiency	06	0	01	01	08
Agron511.5PG students will become expert in Plant ideotypes for drylands plant growth regulators and their role in sustainability	04	0	01	01	06
Total Hours	29	0	06	05	41

suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles		Marks Distribution To					
		R	U	A	Marks			
CO-1	Cropping systems physical resources, soil and water management in cropping systems; assessment of land use		01	01	05			
CO-2	Concept of sustainability in cropping systems and farming systems production potential under monoculture cropping, multiple cropping, Alley cropping, sequential cropping and intercropping, mechanism of yield advantage In intercropping systems.		06	02	10			
CO-3	Above and below ground interactions and allelopathic effects low cost technologies; research need on sustainable agriculture.	03	07	05	15			
CO-4	Crop diversification role of organic matter in maintenance of soil Fertility; fertilizer use efficiency Advanced nutritional tools for big data analysis And interpretation	05	05	05	15			
CO-5	Plant ideotypes for drylands; plant growth regulators and their role in sustainability	01	02	02	05			
Γotal		11	26	13	50			

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Cropping systems and sustainable agriculture to will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different task sapper requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial

- 3. Case Method
- 4. Group Discussion
- 5. Role-play
- 6. Visit to field
- 7. Demonstration
- 8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming.

Suggested Learning Resources:

(a)Books:

S. No.	Title	Author	Publisher	Edition& Year
1	Cropping systems and sustainable agriculture.	panda sc.	Agronbios (india)	2017.
2	. Cropping systems in the tropics; principles and Management.	palaniappansp and sivaraman k.	New age.	1996
3	Cropping and farming systems.	panda sc.	Agronbios.	2003.
4	Principles of crop production.	reddy sr.	Kalyani	2000

Curriculum Development Team

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Cos, POs, and PSOs Mapping Course Code:-Agron- 511

Course Title: -Cropping Systems and Sustainable Agriculture

Course	Program Ou	itcomes								Program Sp	ecific Outcom	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student'	ve crop	alon	and	ement of			knowledge	profitable			ities.	will
	of farming	s contribu	aspects.	g with	plant				of, and need for	decisions. To				affect futuristic
	and farming	tions.		_	protec	agrono mical			sustainable	understand				
	system in	tions.		eval uatio	tion econo	packag			developme	the				agricultu re
	India			n	mic	e and			nt in	mechanics				10
	Illuia			whic	associ	practic			Agricultur	of agri				
				h	ated	es.			e.	Entreprene				
				will	with	C 5.			C.	urship.				
				prov	farmin					aromp.				
				ed to	g									
				deci	enterp									

				sion in vari ous part of agric ultur e	rises.									
CO1- Students acquaint will familiar with the knowledge ofCropping systemsphysi cal resources, soil and water management in cropping systems.	1	3	3	1	1	3	3	1	3	2	1	1	3	3
CO2 students will able to acquaints knowledge aboutConcept of sustainability in cropping systems and farming systems and	1	1	3	3	1	3	2	1	1	3	1	3	3	1

types of cropping system and its advantages.														
CO3 Students will able to identify the interactions and allelopathic effects; competition relations and become become expert in calculate the monetary returns	3	2	1	1	3	1	3	3	2	1	1	2	1	2
CO 4 Students will able to acquaint knowledge to Crop diversificatio n ,role of organic matter in maintenance of soil Fertility, crop	3	2	1	1	σ	3	2	1	1	3	1	3	2	3

residue management and nutrient use efficiency.														
CO5PG students will become expert in Plant ideo types for dry lands plant growth regulators and their role in sustainability.	3	2	1	1	3	1	3	1	3	2	1	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Cropping Systems and Sustainable Agriculture

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1-Students	SO1.1		Unit-1.Cropping systems: definition,	As mentioned in page
7,8,9	acquaint will	SO1.2		indices and its importance; physical	number
PSO 1,2, 3, 4, 5	familiar with the	SO1.3		resources, soil	
	knowledge of	SO1.4		And water management in cropping	
	Cropping systems			systems; assessment of land use.	
	physical resources,			1.1, 1.2,1.3,1.4,1.5.	
	soil and water				
	management in				
	cropping systems.				
PO 1,2,3,4,5,6	CO2 students will	SO1.1		Unit-2 Concept of sustainability in	As mentioned in page
7,8,9	able to acquaints	SO1.2		cropping systems and farming systems,	number
	knowledge about	SO1.3		scope and	
PSO 1,2, 3, 4, 5	Concept of	SO1.4		Objectives; production potential under	
	sustainability in	SO1.5		monoculture cropping, multiple cropping,	
	cropping systems			Alley cropping, sequential cropping and	
	and farming systems			intercropping, mechanism of yield	
	and types of			advantage	
	cropping system and			In intercropping systems.	
	its advantages.			1.1, 1.2,1.3,1.4,1.5, 1.6, 1.7, 1.8	
PO 1,2,3,4,5,6	CO3Students will	SO1.1		Unit-3Above and below ground	As mentioned in page
7,8,9	able to identify the	SO1.2		interactions and allelopathic effects;	number
	interactions and	SO1.3		competition relations;	
PSO 1,2, 3, 4, 5	allelopathic effects;	SO1.4		Multi-storied cropping and yield stability	
	competition	SO1.5		in intercropping, role of non-monetary	
	relations and			Inputs and low cost technologies;	
	become become			research need on sustainable agriculture.	

	expert in calculate the monetary returns		1.1, 1.2,1.3,1.4,1.5, 1.6	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 Students will able to acquaint knowledge to Crop diversification ,role of organic matter in maintenance of soil Fertility, crop residue management and nutrient use efficiency.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit 4Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency and concept of fertilizer Use in intensive cropping system. Advanced nutritional tools for big data analysis And interpretation. 1.1, 1.2, 1.3, 1.4 1.5, 1.6	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5PG students will become expert in Plant ideotypes for dry lands plant growth regulators and their role in sustainability.	SO1.1 SO1.2 SO1.3 SO1.4	Unit 5 Plant ideotypes for dry lands; plant growth regulators and their role in sustainability. 1.1, 1.2,1.3,1.4	As mentioned in page number



Faculty of Agriculture Science and technology
Department of Agronomy
Curriculum of M.Sc Ag Agronomy Program

Course Code: SOIL 506

Course Title: Soil Biology And Biochemistry

Pre- requisite: Student should have basic knowledge of bio fertilizers and useful

microorganisms available in soil help in transforming the fixed forms of nutrients. They know about the various organic waste (plant

/animal/rural and urban wastes).

Rationale: The Student learn about available soil microorganisms help in

dissolving the fixed form of plant essential nutrients absorbed by the crop. Transformation and lifecycle of all essential plant nutrients. The manufacturing of various bio fertilizers available in market, their composition, combination, properties and use. Importance, principle and role organic farming with the use of consortium for

maintaining fertility and sustainability in soil.

Course Outcomes:

Soil 506.1: They understand about the Diversity of microbes in soil, their ecosystem and life cycle.

Soil 506.2: To relate the various interaction of soil microbes with crop and their transformation process in soil.

Soil 506.3: To recollect and implement the knowledge of various methods of biodegradation of pesticides, organic wastes and their use for production of biogas,

Soil 506.4: To practices the manufacturing of various forms of organic manures, and bio fertilizers with its application use and importance in maintain soil health.

Soil 506.4: To practices the manufacturing, application of organic manure and bio fertilizers in soil

Scheme of Studies:

Course Category	Course Code	Course Title		Scheme of studies(Hours/Week)			Total Credits	
			Cl	LI	sw	SL	Total Study Hours (CI+LI+SW+SL)	(C)
Progra mCore (PCC)	Soil 506	Soil Biology and Biochemistry	2	1	1	1	5	3

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial(T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and

feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

			Scheme of Assessment (Marks)							
			Prog	gressive A	ssessme	ent (PR	A)		End Semeste r	Tota l Mark
Course Catego ry	Cous e Cod e	Course Title	Class/ Home Assign ment 5 numbe r 3 mar ks eac h (CA)	Class Test 2 (2 best out of3) 10 mark s each (CT)	Sem inar one	Clas s Acti vity any one (C AT)	Class Attenda nce (AT)	Total Marks CA+CT+SA+C AT+AT)	Assessme nt (ESA)	(PR A+ ES A)
PCC	Soil 506	Soil Biology and Biochemi stry	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Soil 506.1: To classification of soil biota, its ecosystem and various interaction occurs with

Approximate Hours

	1 1
Item	AppXHr
	S
Cl	05
LI	4
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1:It gives General introduction on bio fertilizers, its use and importance.	1.1 Determina tion of soil microbial population	Unit-1 General introduction about soil biota, its ecosystem and various interaction occurs with soil organisms	1. To know about various types of soil organisms
SO1.2:To recall the diversity in soil microbes, there ecosystem and life cycle SO1.3 To learn the different interactions occurs between soil and soil organisms	1.2 To estimate the Soil microbial biomass	1.1 Classification of soil biota and its ecosystem 1.2 Classification of soil microbes 1.3 Importance of soil biota in ecosystem 1.4 Role of soil organisms 1.5 Interaction process occurs with soil organisms	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- Enlist the classification of soil microbes
- Define soil biota its population and ecosystem

b. MiniProject:

c. Other Activities(Specify): NA

Soil 506.2: To learn the various interactions of soil microbes with plants.

AppXHr
S
5
4
2
0
13

Session	Laboratory	Class room Instruction	Self
Outcomes	Instruction	(CI)	Learning
(SOs)	(LI)		(SL)
SO2.1To relate the		Unit: 2: The basic concept,	
different types of	1. Determinati	importance and role of	
interaction of soil microbes	on of Soil	soil microbes	
with crop, there growth	enzymes		
	released by	2.1 To learn the classification of	
SO2.2 To understand the	soil	soil microbes	
principle and role of soil	microbes	2.2 To understand the role of soil	
microbes		microbes in increasing soil	
	2. To Study	fertility	
SO2.3 To discriminate the	therhizosphe	2.3 To know the various enzymes	
various enzymes and	re effect in	released by the microbes	
chemicals released by the	different	2.4 To learn the various chemicals	
microbes.	crops	reactions affecting the growth	
		of microbes in soil	
		2.5 Classification of different	
		Rhizo-bacteria in soil used in	
		different crops	

SW-2 Suggested Sessional Work(SW):

- a. Assignments:
 - Classification, composition and properties of major nutrient fertilizers.
- **b.** Mini Project:
 - Prepare flow chart of integrated nutrient management
- c. Other Activities(Specify): NA

Soil 506 .3: To understand transformation of nutrients with various interaction of soil organism and formation of humus

Item	AppXHr
	S
Cl	5
LI	10
SW	2
SL	1
Total	14

Session Outcomes	Laboratory Instruction (LI)	Class room Instruction	Self Learnin
(SOs)		(CI)	g
			(SL)

SO3.1 To learn the	1. Measurement of	Unit-3: Transformation	1. Making
various process involved	important soil	solubilization and	chart of
during transformation of different nutrients(macro, secondary and micro nutrients) through microbial activity in soil	microbial processes such as ammonification, nitrification, N2 2. To study the determination of fixation of various	mineralization of essential plant nutrient 3.1Microbial transformation of Major nutrients 3.2Microbial transformation of	available forms to essential plants nutrients
SO3.2 To Understand and learn the nutrient cycle. SO3.3 To assess the phility to understand the	nutrients in soil 3. To determine the process involved in S oxidation 4. Estimation of Phosphorus	secondary and Micro nutrients 5.3 Role of soil organic matter and crop residue in maintaining soil fertility and productivity 5.4 Formation and components	
ability to understand the Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.	solubilization and mineralization 5. Estimation of micro nutrients solubilization and mineralization	of humus 5.5 To learn the importance of humus in maintaining soil fertility	

SW-3 Suggested Sessional Work (SW):

- a. Assignments:
 - Humus formation its classification and components
 - Transformation of soil nutrients and factor affecting each of them
- b. Other Activities(Specify): NA

Soil 506 .4: Identification, production, role, importance and use of bio pesticides, organic waste its degradation process and manure application in various crop for sustainable agriculture

**		
Item	AppXHr	
	S	
Cl	6	
LI	8	
SW	2	
SL	2	
Total	12	

Session	Laboratory	Class room Instruction	Self
Outcome	Instruction	(CI)	Learning
s (SOs)	(LI)		(SL)

	1. Element	Unit-4: Production, role and Importance	
SO4.1 To Relate difference between the Riodegradation of	al composition, of organic	of various bio pesticides, degradable substances and organic waste	1. Making chart of useful
the Biodegradation of pesticides,	2. Element al composition,	4.1 To learn the Production techniques of biodegradable pesticides	bio pesticide available in market
so4.2 To Understand and learn the production and use of organic wastes and manures. so4.3 To Understand and learn the production and use of biogas plant and use of slurry in increasing the sustainability of soil	functional groups 3. To study the fractionation of organic matter 4. To study the fractionation of functional groups	 4.2: To know the application methods of biodegradable pesticides in maintaining soil health and increase the crop yield 4.3: To understand the role of biodegradable pesticides in maintaining soil health 4.4. Role of various microbial toxins released in soil 4.5. Production, importance and use of organic waste 	2. Identification of different organic manures and nutrient content in it
		4.6. Role of various biotic factors involved in soil developments	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

• Identification of different organic manures and nutrient content in it

b. Mini-Project

 Preparation of flow chart of identification of various bio pesticides and its application in different crop

Other Activities(Specify): NA

Soil 506.5: Role, importance, preparation and properties of various organic manure and bio fertilizer if different crop to maintain the sustainability of soil

Item	AppXHr
	S
Cl	5
LI	2
SW	2
SL	1
Total	10

Sessio n	Laboratory Instruction	Class room Instruction (CI)	Self Learning
Outc	(LI)	(3-7)	(SL)
omes			
(SOs)			

SO5.1 To know the Effective knowledge on formation and application method of different types of compost, FYM, Vermicomposting.	1. Decompositio n of organic matter in soil	Unit5:Application and preparation of organic manure and bio fertilizers in soil 5.1 To learn the preparation methods of different bulky organic manures 5.2: To learn the preparation methods of different concentrated organic manures	1. Enlist the different Methods of organic waste
SO5.2Understand the procedure , importance, and		5.3Classification and preparation of various bio fertilizers5.4: To learn the Application method used during supply of various bio fertilizers in	and bio fertilizer available in market
classification of different Bio fertilizers		different crops 5.5 Application of different organic manure and bio fertilizer in improving crop production.	

SW-5 Suggested Sessional Work (SW):

- a. Assignments:
 - Preparation Methods of different organic manure in various crops.
- b. MiniProject:
- c. OtherActivities(Specify): NA

SW-5 Suggested Sessional Work (SW):

- d. Assignments:
 - Preparation Methods of different organic manure in various crops.
 - b. MiniProject

OtherActivities(Specify): NA

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessiona 1 Work (SW)	Self Learnin g (Sl)	Total hour (Cl+LI+SW+Sl)
Soil 506.1: To classification of soil biota, its ecosystem and various interaction occurs with soil organisms	5	4	2	2	09
Soil 5062: To learn the various interactions of soil microbes with plants.	7	4	2	2	11
Soil 506 .3: To understand transformation of nutrients with various interaction of soil organism and formation of humus	7	10	2	1	10
Soil 5064: Identification ,	6	8	2	2	10

production, role, importance and use of bio pesticides, organic waste its degradation process and manure application in various crop for sustainable agriculture					
Soil 506.5: Role, importance, preparation and properties of various organic manure and bio fertilizer if different crop to maintain the sustainability of soil	5	2	2	1	08
Total Hours	30	30	30	8	48

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit	M	arks Di	stribution	Total
	Titles	R	U	A	Mark s
CO-1	General introduction about soil biota, its ecosystem and various interaction occurs with soil organisms	03	01	01	05
CO-2	The basic concept , importance and role of soil microbes	02	06	02	10
CO-3	Transformation solubilization and mineralization of essential plant nutrient	03	07	05	15
CO-4	Production, role and Importance of various bio pesticides, degradable substances and organic waste	03	07	05	15
CO-5	Application and preparation of organic manure and bio fertilizers in soil	03	02	-	05
	Total	11	26	13	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Soil Biology and Biochemistry will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

SuggestedInstructional/ImplementationStrategies:

- 1. ImprovedLecture
- 2. Tutorial
- 3. CaseMethod
- 4. GroupDiscussion
- 5. RolePlay
- 6. Demonstration
- 7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, Whatsapp, Mobile, Onlinesources)
- 8. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Introduction to Soil Microbiology	Alexander M	John Wiley & Sons	1977
2	Soil Biology	Burges A & Raw F	Academic Press	1967
3	Soil Biochemistry	McLaren AD & Peterson GH	Vol. XI. Marcel Dekker	1967
4	Soil Microbial Ecology – Applications in Agricultural and Environmental Management.	Metting FB.	ICAR, New Delhi	1993
5	Soil Biochemistry	Paul EA and Ladd JN.	Marcel Dekker	1981
6	Soil Organisms and Litter in the Tropics	Reddy MV. (Ed.).	Oxford & IBH	-
7	Plant Root System: Their Functions and Interaction with the Soil.	Russel RS	ELBS & McGraw Hill.	1977
8	Soil Biochemistry	Stotzky G &Bollag JM	Vol. VIII. Marcel Dekker	1993
9	Principles and Applications of Soil Microbiology.	Sylvia DN.	Pearson Edu	2005
10	Soil and the Environment - An Introduction	Wild A	Cambridge Univ. Press	1993
11	Fundamental of Soil Science	Indian Society of Soil Science	ISSS, National Societies Block, Pusa, New Delhi	Revised 2012
12	Soil Microbiology	SubbaRao N.S	Medtech Scientific International	Revised 2017

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Cos, POs and PSOs Mapping Course Code:-SOIL- 506

Course Title: - Soil Biology and Biochemistry

Course	Program	Outcon	nes							Program	Specific O	utcome		
Outcomes	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detail	Us	Deta	Creat	Stude	Student	Underst	Enable	Acquaint	То		То
	knowled		ed		iled			will	and the		-	undertak	Appl	unders
		know		e		e,	nt will			to	ing with		у	tand
	ge of	ledge	knowl	app	kno	select		apply	impact	recogni	basic	e tasahina	resea	
	various	in the	edge	rop	wled	and	apply	basic	of the	ze and	concepts	teaching	rch	and
	branche	conce	regard	riat	ge	apply	vario	concepts	professi	examine	theories	research	and	analyz
	s of	rning	ing	e ·	of	an	us	in	onal	the	and	and	exper	e the
	agrono	subje	packa	sci	culti	appro	statist	laborato	expert	relation	terminol	extensio	tise	curren
	my will	ct	ge and	ent	vati	priate	ical	ry	solution	ships	ogy of	n	in	t
	be made	which	practic	ific	on	techn	meth	techniqu	s in	between	Agrono	activates	resol	issues
	specializ	will	es soil	me	prac	iques	ods to	es	societal	inputs	my.	along	ving	that
	ed and	impro	fertiliz	tho	tices	,	analy	during	and	and		with	the	are
	to	ve the	er and	ds	,	resou	ze	their	environ	outputs		administ	probl	occurr
	provide	farme	water	col	soil,	rces	their	research	mental	in their		rative	ems	ing in
	knowled	rs	manag	lab	fertil	and	maste	work	context	agricult		and	of	local
	ge	condi	ement	ora	izers	mode	r		s, and	ural		consulta	existi	and
	dissemi	tion	of	tio	,	rn it	resear		demons	field to		ncy	ng	global
	nation	throu	produc	n	wate	tools	ch		trate the	make		services.	farm	agricu
	regardin	gh	tive	wit	r	in	work		knowle	effectiv			in the	lture
	g	stude	crop	h	man	impr			dge of,	e and			perip	and
	various	nt's	aspect	stat	age	ovem			and need for	profitab le			hery of	how
	techniqu	contri	S.	isti	men	ent of				-				they will
	e of	butio		CS	t and				sustaina	decision s. To			unive	affect
	farming	ns.		alo	plan	agron			ble				rsitie	
	and			ng wit	t	omic al			develop	understa nd the			S.	futuris tic
	farming				prot				ment in	mechani				
	system			h	ectio	pack			Agricul					agricu
	in India			eva	n	age	1	ĺ	ture.	cs of			1	lture

				lua tio n wh ich wil l pro ved to dec isio n in var iou s par t of agr icu	econ omi c asso ciate d with farm ing ente rpris es.	and practices.				agri Entrepr eneurshi p.				
				icu ltur										
CO1They understand about the Diversity of microbes in soil, their ecosystem and life cycle.	3	1	1	e 1	3	1	3	3	1	3	1	2	3	1

CO2 To relate the various interaction of soil microbes with crop and their transformation process in soil.	3	3	3	3	1	1	1	3	1	3	3	1	2	1
recollect and implement the knowledg e of various methods of biodegrad ation of pesticides, organ ic wastes and their use for production of biogas	3	2	3	1	1	1	3	1	3	3	2	2	1	2
CO 4 To practices the	3	1	1	1	3	1	3	3	1	3	1	3	2	1

manufacturi ng of various forms of organic manures, and bio fertilizers with its application use and importance in maintain soil health.														
CO5To practices the manufacturi ng,applicatio n of organic manure and bio fertilizers in soil	3	3	1	1	1	3	1	1	3	1	1	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Soil Biology and Biochemistry

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1 They understand	SO1.1		Unit-1.General introduction about soil	As mentioned in
7,8,9	about the Diversity of	SO1.2		biota, its ecosystem and various	page number
PSO 1,2, 3, 4, 5	microbes in soil, their ecosystem and life cycle.	SO1.3		interaction occurs with soil organisms 1.1, 1.2,1.3,1.4,1.5.	
PO 1,2,3,4,5,6	CO2 To relate the	SO1.1		Unit-2 The basic concept , importance	As mentioned in
7,8,9	various interaction of	SO1.2		and role of soil microbes	page number
PSO 1,2, 3, 4, 5	soil microbes with crop and their transformation process in soil.	SO1.3		1.1, 1.2,1.3,1.4,1.5	
PO 1,2,3,4,5,6	CO3To recollect and	SO1.1		Unit-3 Transformation solubilization	As mentioned in
7,8,9	implement the	SO1.2		and mineralization of essential plant	page number
PSO 1,2, 3, 4, 5	knowledge of various methods of biodegradation of pesticides,	SO1.3		nutrient 1.1, 1.2,1.3,1.4,1.5	
	organic wastes and				
	their use for production of biogas				
PO 1,2,3,4,5,6	CO 4 To practices the	SO1.1		Unit 4 Production, role and Importance of	As mentioned in
7,8,9	manufacturing of various	SO1.2		various bio pesticides, degradable	page number
PSO 1,2, 3, 4,	forms of organic manures, and bio	SO1.3		substances and organic waste 1.1, 1.2,1.3,1.4 1.5, 1.6	•••••
5	manures, and bio fertilizers with its			1.2,1.3,1.4 1.3, 1.0	
	application use and				
	importance in maintain				
	soil health.				

PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4,	CO5To practices the manufacturing, application of organic manure and bio fertilizers in soil	SO1.1 SO1.2	Unit 5 Application and preparation of organic manure and bio fertilizers in soil 1.1, 1.2,1.3,1.4 1.5	As mentioned in page number
5				



AKS University Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code: SOIL 508

Course Title: Soil water and air pollution

Pre- requisite: Student should have basic knowledge of various forms of pollutants

present in soil, water and air.

Rationale: The Student learn about the measurement of soil, water and air

pollution, their optimum level. What are the norms to reduce the pollution from soil, air and water used by government in India and

world for maintaining ecofriendly nature.

Course Outcomes:

Soil 508.1: To identify the problems occur in agriculture sector regarding polluted water, air and soil their mode of occurrence and extended level

Soil 508.2: To learn the Nature, sources and effect of various pollutants on fertility, production and productivity of soil and crop including human health

Soil 508.3: Assess the forms and properties of various effluents released from Sewage and different industrial waste their by effect on growth of living organisms

Soil 508.4: Classification and behavior of pesticides in soil, and their effect on soil microorganisms

Soil 508.5: To understand the sources and behavior of released toxic substances affect in Soil, water, Air and human health

Soil 508.6: To understand the sources and reclamation tactics in managing the effect of release of GH gasses contribution and pesticide on reducing Soil, plant, water and Air

Soil 508.7: Risk assessment of polluted soil and reclamation of contaminated Soil, water,

Air and human health

Scheme of Studies:

	Course					eme of ies(Hou	rs/Week)	Total Credi
Course Catego ry	Code	Course Title	Cl	LI	S W	SL	Total Study Hours (CI+LI+SW+S L)	ts (C)

Progra mCore Soil 509 Soil water ar air pollution	d 2	2	1	1	5	3
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Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial(T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

					Schem	e of Ass	sessment (M	larks)		
				Pro	ogressiv F	e Asses	sment (End Semeste r Assessme	Tota l Mark s
Cou rse Cat ego ry	Cous e Code	Course Title	Class/H ome Assign ment 5 number 3 mar ks eac h (CA)	Class Test 2 (2 best out of3) 10 marks each (CT)	Sem inar one (SA)	Clas s Acti vity any one (C AT)	Class Attendan ce (AT)	Total Marks (CA+CT+SA+C AT+AT)	nt (ESA)	(PR A+ ES A)
Prog ramC ore (PCC)	Soil	Soil, water and air pollution	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Soil 508 .1: Toidentify the problems occur in agriculture sector regarding polluted water, air and soil their mode of occurrence and extended level

Approximate Hours

Item	AppXHrs
Cl	4
LI	2
SW	2
SL	1
Total	09

Session Outcomes	Laboratory	Class room Instruction	Self Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
	1.To determine	Unit-1Source of air, water and	1. To know
SO1.1:To recall	the BOD of a	soil pollution which affect the	about various
the various	given water	crop production	pollutants
types of	sample		and their
pollution and		1.1 Understand the	sources of
there sources		various types and source of soil pollution	soil , water and air
SO1.2:To discriminate the different types of		1.2 Understand the various types and source of water pollution	pollution
pollution occur in agricultural field,		1.3 Understand the various types and source of air pollution	
their source.		1.4 Effect of soil, water and air pollution on growth and	
		development of crop	

SW-1 Suggested Sessional Work (SW):

a) Assignments:

Enlist the various pollutants affecting soil, water and air

b) MiniProject: NA

c) Other Activities(Specify): NA

Soil 508. .2: To learn the Nature, sources and effect of various pollutants on fertility, production and productivity of soil and crop including human health

Item	AppXHr
	S
Cl	4
LI	6
SW	2
SL	1
Total	13

Session	Laboratory	Class room	Self Learning
Outcomes	Instruction	Instruction	(SL)
(SOs)	(LI)	(CI)	
SO2.1 To assess the nature and	1. To determine the	Unit-2.0 To Study the	1.Enlist the
sources of pollutants	nitrate and	Soil, water and air	various role of
originates from agricultural	ammonium nitrogen	pollution and there	fertilizers,
field (through fertilizers and	content of a given	problems	pesticides and
pesticides)	soil, and water		herbicides in
SO2.2 To assess the nature	sample	1.1 To discuss about	increasing the
and sources of pollutants		the Soilpollution.	Soil, water and air
originates from, industrial	2.To determine the	1.2 To discuss about	pollution
area,	available	the water pollution.	
	phosphorus content	1.3 To discuss about	
	in a give soil and	the air pollution.	
SO2.3 To assess the nature	water sample	1.4 To Learn the	
and sources of pollutants		problems associated with	
originates from urban wastes	3. To determine the	agriculture, nature	
lands, acid rains.	available heavy	contaminating the soil,	
	metal content in	water and plant	
	given soil /water		
	effluents		

SW-2 Suggested Sessional Work(SW):

Assignments:

- 1. Enlist the nature and sources of pollutants originates from urban wastes lands,
- 2. Factors responsible in cause of acid rains
- a. Mini Project:
- b. Other Activities(Specify): NA

Soil 508.3: Assess the forms and properties of various effluents released from Sewage and different industrial waste their by effect on growth of living organisms

	1 1
Item	AppXHrs
Cl	4
LI	6
SW	2
SL	1
Total	13

Session Outcom es	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learnin g
(SOs)			(SL)
SO3.1 Evaluate the	1. To know the	Unit-3: To understand the	1. to know about
effect of sewage water	Sampling method and	forms and properties of	the various
on plant growth and	precaution measure	various effluents released	industries
human beings SO3.2 To Understand	should be taken during colleting sewage waters and sludge	from Sewage and industrial 3.1 To learn about Sewage effluents—their composition	running in your surrounding and their discarded
the effect of industrial effluents on growth and development of living beings	2. To know the Sampling method and precaution measure should be taken during colleting the solid/liquid industrial waste, 3. To know the Sampling method and precaution measure should be taken during colleting polluted soils and plant	 3.2 To learn about industrial effluents—their composition 3.3 To understand the effect of Sewage &industrial effluents on soil properties/ health, and plant growth and human beings. 3.4 To understand the soil as sink for waste disposal 	material

SW-3 Suggested Sessional Work (SW):

a) Assignments:

Effect of industrial effluents on growth and development of living beings

b) Other Activities(Specify): NA

Soil 508:4: Classification and behavior of pesticides in soil, and their effect on soil microorganisms

	I I
Item	AppXHr
	S
Cl	4
LI	2
SW	2
SL	2
Total	10

Session Outco mes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
	1. Management of contaminants in soil and plants to safeguard food safety	Unit-4: Study the pesticides—their classification, and soil microorganisms. 4.1 To study the classification of Pesticides 4.2 To learn the effect of Pesticides in soil properties 4.3 To learn the effect of Pesticides on growth and development of soil microorganisms. 4.4 To understand the effect of Pesticides on growth and development of crop	1. Making chart of useful bio pesticide available in market 2. Identification of different banned pesticides but still supplied in market

SW-4 Suggested Sessional Work (SW):

- a. Assignments:
 - 1. Role of pesticides in affecting the population of useful microorganisms
- b. Other Activities(Specify): NA

Soil 508.5: To understand the sources and behavior of released toxic substances affect in Soil, water , Air and human health

Item	AppXHr
	S
Cl	4
LI	4
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laborator y Instructio	Class room Instruction (CI)	Self Learning (SL)
	n (LI)		
SO5.1 To identify the various sources and behavior of released of release of toxic	determination	Unit-5: Study the Toxic elements and there management. 5.1 To learn about different	1. Enlist the different types of toxic
substances in soil	oxides of	types of Toxic elements present in soil 5.2 To learn the different	substances affect the soil, water and air
SO5.2To identify the various sources and behavior of	sulphur 2. Visit to	sources of Toxic elements present in soil	
released of toxic substances in plants	various industrial sites to study	5.3 To learn the behavior of different Toxic elements present in soil	
SO5:3. To identify the various sources and behavior of released of toxic substances in human beings	the impact of pollutants on soil and plants	5.4 Understand the effect on nutrients availability, effect on plant and human health.	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- Enlist the various sources and behavior of released of toxic substances in soil and plants
- Enlist the various sources and behavior of released of toxic substances in water
- Enlist the various sources and behavior of released of toxic substances in Air
- Enlist the various sources and behavior of released of toxic substances in human beings

b. MiniProject:

• Llist of toxic substances released from various industries affect the soil, water and air

OtherActivities(Specify): NA

Soil 508.6: To understand the sources and reclamation tactics in managing the effect of release of GH gasses contribution and pesticide on reducing Soil, plant, water and Air

Item	AppXHr
	S
Cl	5
LI	4
SW	2
SL	1

Total	12

Session Outcomes	Laboratory	Class room Instruction	Self
(SOs)	Instruction (LI)	(CI)	Learning (SL)
SO6.1 To review on cause of Pollution of water resources and its reclamation strategies SO6.2To understand the cause of release of GH gasses and its reclamation strategies SO6:3. To identify		Unit .6: Study the pollution of water and green house gasses. 6.1 To learn about the various ways of water Pollution resources due to leaching of nutrients and pesticides from soil. 6.2 To learn about the various ways of water Pollution resources due to effect of pesticides in soil 6.3 To understand the various sources responsible in emission of green house gases—carbon dioxide, methane and nitrous oxide in atmosphere 6.4 To know the emission of green house gases—carbon dioxide, methane and nitrous oxide	(SL) 1. Enlist the various GH Gases and their contributi on in depletion of ozone layer of earth
the forms of pesticides affect the soil health		6.5 To study the different practices to manage both water and air pollution through leaching and emission of GHG respectively	

SW-5 Suggested Sessional Work (SW):

a) Assignments:

Identify the sources of GH gasses its contribution in affecting the ozone layer depletion

b) MiniProject: NA

c) OtherActivities(Specify): NA

Soil 508.7: Risk assessment of polluted soil and reclamation of contaminated Soil, water, Air and human health

Item	AppXHr
	S
Cl	5
LI	6
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction	Class room Instruction (CI)	Self Learning (SL)
	(LI)		
SO7.1 To assess the soil pollution	1.Estimation of dissolved and suspended solids in	Unit-7: Study the polluted contaminated soil and water and there management	1. To learn the use of interment and
SO7.2 To reclamation the polluted soil, and	water.	7.1 To learn about the Risk assessment of polluted soil	basic computer
water	2.To determine the chemical oxygen	7.2 Remediation/ amelioration of contaminated soil and water	knowledge in operating GIS
SO7:3. To learn the use of remote sensing in assessing	demand (COD) of a given water sample 3. To determine the	7.3 Remediation/ amelioration of contaminated water	software
the management of polluted soil and	(DO) of a given water	7.4 To know the remote sensing applications in monitoring	
water	sample	7.5 To know the remote sensing applications in management of soil and water pollution.	

SW-5 Suggested Sessional Work (SW):

b. Assignments:

1. To use the remote sensing in assessing the management of polluted soil and water and locating techniques in map

b. MiniProject:

OtherActivities(Specify): NA

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
Soil 508.1 To identify the problems occur in agriculture sector regarding polluted water, air and soil their mode of occurrence and extended level	4	2	2	1	9
Soil 508.2 To learn the Nature, sources and effect of various pollutants on fertility, production and productivity of soil and crop including human health	4	6	2	1	13
Soil 508.3 Assess the forms and properties of various effluents released from Sewage and different industrial waste their by effect on growth of living organisms	4	6	2	1	13
Soil 508.4 Classification and behavior of pesticides in soil, and their effect on	4	2	2	2	10

soil microorganisms					
Soil 508.5 To understand the sources and behavior of released toxic substances affect in Soil, water, Air and human health	4	4	2	1	11
Soil 508.6 To understand the sources and reclamation tactics in managing the effect of release of GH gasses contribution and pesticide on reducing Soil, plant, water and Air	5	4	2	1	12
Soil 508.7 Risk assessment of polluted soil and reclamation of contaminated Soil, water, Air and human health	5	6	2	1	14
Total Hours	30	30	15	8	82

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Di	arks istribut		Total Marks
CO-1	Source of air, water and soil pollution which affect the crop production	R 03	02	02	07
CO-2	To Study the Soil, water and air pollution and there problems	02	03	03	8
CO-3	To understand the forms and properties of various effluents released from Sewage and industrial	03	03	02	8
CO-4	Study the pesticides—their classification, and soil microorganisms.	02	02	03	7
CO-5	Study the Toxic elements and there management	03	02	02	7
CO-6	Study the pollution of water and green house gases	02	02	02	6
CO-7	Study the polluted contaminated soil and water and there management	03	02	02	7
	Total	18	16	16	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Soil Water and Air Pollution will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semesterassessment.

SuggestedInstructional/ImplementationStrategies:

- 1. ImprovedLecture
- 2. Tutorial
- 3. CaseMethod
- 4. GroupDiscussion
- 5. RolePlay
- 6. Demonstration
- 7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Onlinesources)
- 8. Brainstorming

Suggested Learning Resources:

(a) Books:

S.No.	Title	Author	Publisher	Edition &
				Year
1	Soil Management and	Lal R, Kimble J,	CRC Press	1995
	Greenhouse Effect	Levine E and Stewart		
		BA.		
2	. Industrial Pollution Control	Middlebrooks EJ.	John Wiley Interscience	1979
3	Toxic Metals in Soil Plant	Ross SM.	John Wiley & Sons	-
	Systems.			
4	Environmental Pollution and	Vesilund PA and	Ann Arbor Science	1983
	Control	Pierce	Publication	
5	Fundamental of Soil Science	Indian Society of Soil	ISSS, National	Revised 2012
		Science	Societies Block, Pusa,	
			New Delhi	
6	The Nature and properties of	Nyle B Brady and Ray	Pearson Education	Revised 2013
	Soils	R Weil		

Curriculum Development Team

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Cos, POs and PSOs Mapping Course Code:- SOIL 508

Course Title: - Soil water and Air Pollution

Course	Program (Outcomes	S							Program S	Specific Out	come		
Outcomes	PO1	PO2	PO3	PO	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO	PSO 5
				4									4	
	Specific	Wide	Detaile	Use	Detai	Create	Studen	Student	Understa	Enable to	Acquainti	То	Apply	To
	knowledg	knowl	d	app	led	,	t will	will	nd the	recogniz	ng with	undertake	resear	underst
	e of	edge	knowle	ropr	know	select	apply	apply	impact	e and	basic	teaching	ch	and
	various	in the	dge	iate	ledge	and	variou	basic	of the	examine	concepts	research	and	and
	branches	concer	regardi	scie	of	apply	S	concepts	professio	the	theories	and	expert	analyze
	of	ning	ng	ntifi	cultiv	an	statisti	in	nal	relations	and	extension	ise in	the
	agronom	subjec	packag	c	ation	appro	cal	laborator	expert	hips	terminolo	activates	resolv	current
	y will be	t	e and	met	practi	priate	metho	У	solutions	between	gy of	along	ing	issues
	made	which	practice	hod	ces,	techni	ds to	technique	in	inputs	Agronom	with	the	that are
	specialize	will	s soil	S	soil,	ques,	analyz	s during	societal	and	у.	administra	proble	occurri
	d and to	impro	fertilize	coll	fertili	resour	e their	their	and .	outputs		tive and	ms of	ng in
	provide	ve the	r and	abo	zers,	ces	master	research	environ	in their		consultan	existi	local
	knowledg	farmer	water	rati	water	and	resear	work	mental	agricultu		cy	ng	and
	e diagomin	s conditi	manage	on	mana	moder n it	ch		contexts,	ral field		services.	farm in the	global
	dissemin ation		ment of product	wit h	geme	n n tools	work		and demonst	to make effective				agricult ure and
	regarding	on throug	ive	stati	nt and	in			rate the	and			periph ery of	how
	various	h	crop	stati	plant	impro			knowled	profitabl			univer	they
	technique	studen	aspects.	S	prote	veme			ge of,	e			sities.	will
	of	t's	авреств.	alo	ction	nt of			and need	decisions			Sitios.	affect
	farming	contri		ng	econ	agron			for	. To				futurist
	and	bution		wit	omic	omica			sustaina	understa				ic
	farming	S.		h	assoc	1			ble	nd the				agricult
	system in			eval	iated	packa			develop	mechanic				ure
	India			uati	with	ge			ment in	s of agri				
				on	farmi	and			Agricult	Entrepre				
				whi	ng	practi			ure.	neurship.				

				ch will pro ved to deci sion in vari ous part of agri cult ure	enter prise s.	ces.								
cO-1 To identify the problems occur in agricultur e sector regarding polluted water, air and soil their mode of occurrenc e and extended level CO-2	1	3	3	1	2	1	3	3	3	3	1	2	3	1
To learn	3	1	3	3	1	2	1	3	3	1	1	3	2	1

the Nature, sources and effect of various pollutants on fertility, productio n and productiv ity of soil and crop including human health														
Assess the forms and properties of various effluents released from Sewage and different industrial waste their by effect on growth of living organism s	1	3	3	1	2	1	3	3	1	3	2	2	1	2

CO-4 Classifica tion and behavior of pesticides in soil, and their effect on soil microorg anisms CO-5 To	3	1	2	3	3	3	1	1	2	1	3	1	3	1
understan d the sources and behavior of released toxic substance s affect in Soil, water, Air and human health				1			1	1		•				
CO-6 To understan d the sources and	3	2	2	1	3	3	1	1	2	1	3	1	3	1

		l	l			1	1							
reclamati														
on tactics														
in														
managing														
the effect														
of														
release of														
GH														
gasses														
contributi														
on and														
pesticide														
on														
reducing														
Soil,														
plant,														
F,														
water														
water														
and Air	2	2	2	1	2	2	1	1	2	1	2	1	2	1
and Air CO-7	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted soil and	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted soil and reclamatio	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted soil and	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted soil and reclamatio	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted soil and reclamatio n of contamina	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted soil and reclamatio n of contamina ted Soil,	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted soil and reclamatio n of contamina ted Soil, water,	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted soil and reclamatio n of contamina ted Soil, water, Air and	3	2	2	1	3	3	1	1	2	1	3	1	3	1
and Air CO-7 Risk assessmen t of polluted soil and reclamatio n of contamina ted Soil, water,	3	2	2	1	3	3	1	1	2	1	3	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – Hig

Course Curriculum Map: Soil water and Air Pollution

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	cO-1 To identify the problems occur in agriculture sector regarding polluted water, air and soil their mode of occurrence and extended level	SO1.1 SO1.2 SO1.3		Unit 1 Source of air, water and soil pollution which affect the crop production 1.1,1.2,1.3,1.4,	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO-2 To learn the Nature, sources and effect of various pollutants on fertility, production and productivity of soil and crop including human health	SO1.1 SO1.2 SO1.3		Unit 2 To Study the Soil, water and air pollution and there problems. 1.1,1.2,1.3,1.4	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO-3 Assess the forms and properties of various effluents released from Sewage and different industrial waste	SO1.1 SO1.2		Unit 3 To understand the forms and properties of various effluents released from Sewage and industrial 1.1,1.2,1.3,1.4	As mentioned in page number

PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	their by effect on growth of living organisms CO-4 Classification and behavior of pesticides in soil, and their effect on soil microorganisms	SO1.1 SO1.2	Unit 4 Study the pesticides—their classification, and soil microorganisms. 1.1,1.2,1.3	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO-5 To understand the sources and behavior of released toxic substances affect in Soil, water, Air and human health	SO1.1 SO1.2 SO1.3	Unit 5 Study the Toxic elements and there management 1.1,1.2,1.3,1.4	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	cO-6 To understand the sources and reclamation tactics in managing the effect of release of GH gasses contribution and pesticide on reducing Soil, plant, water and Air	SO1.1 SO1.2 SO1.3	Unit 6 Study the pollution of water and green house gases. 1.1,1.2,1.3,1.4,1.5	

PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO-7 Risk assessment of polluted soil and reclamation of contaminated Soil, water, Air	SO1.1 SO1.2 SO1.3	Unit 7 Study the polluted contaminated soil and water and there management. 1.1,1.2,1.3,1.4,1.5	
	and human health			



AKS University

Faculty of Agriculture Science and technology
Department of Agronomy
Curriculum of M.Sc Ag Agronomy Program

Course Code: STAT-502

Course Title: Statistical Methods for Applied Science

Pre-requisite: Statistical knowledge helps you use the proper methods to collect the

data, employ the correct analyses, and effectively present the results. Statistics is a crucial process behind how we make discoveries

in science, make decisions based on data, and make predictions.

Rationale: Statistical methods involved in carrying out a study include planning,

designing, collecting data, analysing, drawing meaningful interpretation and reporting of the research findings. The statistical analysis gives meaning to the meaningless numbers, thereby breathing

life into a lifeless data.

Course Outcomes:

CO1 This course will help students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study.

CO2 It can be used to find the best solution to any problem be it simple or complex.

CO3 Concept of correlation, various correlation coefficients- Pearson's correlation coefficient, Spearman's rank correlation coefficient, partial correlation coefficient and Multiple correlation coefficient.

CO4 To understand the process of hypothesis testing and its significance. Testing of hypothesis using Non-Parametric tests like Median test, Runs test, U test, Kruskal Wallis test etc. and ability to use them judiciously for the testing of given data.

CO5 Apply the different sampling methods for designing and selecting a sample from a population. Compare the pairs of treatment means using different methods when null hypothesis in rejected in ANOVA.

Scheme of Studies:

Board of	Course	Course Title			Scher	Scheme of studies(Hours/Week)		
Study	Code		Cl	LI	\mathbf{SW}	SL	Total Study Hours	Credits
							(CI+LI+SW+SL)	(C)
Program	STAT-502	Statistical	2	01	02	01	6	3
Core		Methods for Applied						
(PCC)		Science						

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

lileol y	1			1 6 4		(34)			
				cheme of As		<u> </u>		End Semester Assessment	Total Mark s
Board of Study	Course Code	Course Title	Class/Home Assignment 1 number 5 marks each (CA)	Class Test 2 (2 best out) 15 marks each (CT)	Practic al Exam	Class Attendan ce (AT)	Total Marks (CA+CT+ PA+AT)		(PRA+ ESA)
PCC	STAT-502	Statistical Methods for Applied	5	30	10	5	<u>PA+AT)</u> 50	50	100

Science				

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

STAT-502 CO-1 Know the applications of Statistics and learn and apply these techniques in the agriculture field.

Item	Appx. Hrs.
CI	6
LI	2
SW	1
SL	2
Total	11

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Apply laws of probability to concrete problems. SO1.2 Perform statistical inference in several circumstances and interpret the results in an applied context. SO1.3 Communicate concepts in probability and statistics using both technical and nontechnical language. SO1.4 Use a statistical software package for computations with data,	1) To impart knowledge on Statistical concepts like Exploratory data analysis.	Unit-1. Box-plot, Descriptive statistics, Exploratory data analysis, Theory of probability, Random variable and mathematical expectation. 1.1. Box-plot 1.2 Descriptive statistics 1.3 Exploratory data analysis 1.4 Theory of probability. 1.5 Random variable 1.6Mathematical expectation.	1. Prepare the assignment on Random variable and mathematical expectation.

- a. Assignments: Prepare the assignment on Random variable and mathematical expectation.
- b. Mini Project: -
- c. Other Activities (Specify):-

STAT-502 CO-2 Find the best solution to any problem be it simple or complex.

Item	Appx. Hrs.
CI	6
LI	8
SW	1
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction	Classroom Instruction (CI)	Self- Learnin
	(LI)		g (SL)
SO2.1 Recognize the binomial probability distribution and apply it appropriately. SO2.2 Recognize the Poisson probability distribution and apply it appropriately. SO2.3 Recognize and understand discrete probability distribution functions, in general. SO2.4 Recognize the standard normal probability distribution and apply it appropriately. SO2.5 Compare normal probabilities by converting to the standard normal	1- Fitting of Binomial distributions. 2- Fitting of Poisson distributions. 3- Fitting of Negative Binomial distributions. 4- Fitting of Normal distributions.	Unit-2 Discrete and continuous probability distributions, Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications. Concept of sampling distribution: chisquare, t and F distributions. Tests of significance based on Normal, chisquare, t and F distributions. 1.1 Discrete and continuous probability distributions 1.2 Binomial, Poisson, Negative Binomial 1.3. Normal distribution, Beta and Gamma distributions and their applications 1.4 Concept of sampling distribution: chi-square, t and F distributions.	1. Prepare the assignment on Binomial, Poisson, Negative Binomial, Normal
distribution.		1.5 Tests of significance based on Normal, chi-square.1.6 Tests of significance based on t	
		and F distributions.	

Assignments: Prepare the assignment on Simple Problems Based on Probability. Binomial & Poisson Distributions.

a. Other Activities (Specify):

STAT-502 CO-3 Concept of correlation, various correlation coefficients- Pearson's correlation coefficient, Spearman's rank correlation coefficient, partial correlation coefficient and Multiple correlation coefficient.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	6
SW	1
SL	2
Total	15

Session Out Comes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO3.1 Create and analyze scatter	1- Large		1. Prepare the
plots.	sample tests,	Scatter Diagram. Karl Pearson's	assignment on
	testing of	Coefficient of Correlation. Linear	Karl Pearson's
SO3.2 Discuss basic ideas of linear	hypothesis	Regression Equations.	Coefficient of
regression and correlation.	based on		Correlation. Linear
502.2 Create and interpret a line of	exact	1.2 Types of Correlation	Regression
SO3.3 Create and interpret a line of	sampling	1.3 . Scatter Diagram	Equations.
best fit.	distributions	1.4 . Karl Pearson's Coefficient of	
SO3.4 Calculate and interpret the	~ chi square,	Correlation	
correlation coefficient.	t and F.	1.5 Definition of Regression.	
	2- Large	1.6 . Linear Regression Equations	
	sample tests,		
	testing of		
	hypothesis		
	based on		
	exact		
	sampling		
	distributions		
	~t-test.		
	3- Large		
	sample tests,		
	testing of		
	hypothesis		
	based on		

eXact sampling distributions ~F- test.	

Assignments: Prepare the assignment on Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

b. Other Activities (Specify):

STAT-502 CO-4 understand the process of hypothesis testing and its significance. Testing of hypothesis using non-Parametric tests like Median test, runs test, U test, Kruskal Wallis test etc. and ability to use them judiciously for the testing of given data.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	8
SW	1
SL	2
Total	17

Session Out Comes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO4.1 Conduct and interpret	1- Confidence	Unit-4 Introduction to Test	1. Prepare the
hypothesis tests for a single	interval	of Significance, One sample	assignment on Chi-Square
, , ,	estimation and	& two sample test t for	Test of Independence of
population mean, population	2- Correlation	Means, Chi-Square Test of	Attributes in 2×2
standard deviation known.	analysis	Independence of Attributes	Contingency Table.
SO4.2 Conduct and interpret	3- Regression	in 2 ×2 Contingency Table.	
hypothesis tests for a single	analysis	1.1 Introduction to Test of	
population mean, population	•	Significance	
, , , , , ,		1.2 One sample	

standard deviation unknown.	Linear and	1.3 Two sample test t for
SO4.3 Describe hypothesis testing in general and in practice	Quadratic Model.	Means 1.4 Definition of Chi- Square 1.5 Application of Chi-
so4.4 Interpret the chi-square probability distribution as the sample size changes. so4.5 Conduct and interpret chi-square goodness-of-fit hypothesis tests.		square test 1.6 Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table

Assignments: Prepare the assignment on Chi-Square Test of Independence of Attributes in 2×2 Contingency Table

c. Other Activities (Specify):

STAT-502 CO-5 Apply the different sampling methods for designing and selecting a sample from a population. Compare the pairs of treatment means using different methods when null hypothesis in rejected in ANOVA.

Item	Appx Hrs.
CI	6
LI	6
SW	1
SL	2
Total	15

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
SO5.1 Recognize and	1- Non-parametric	Unit-5 Introduction to Analysis	1. Prepare the
differentiate between key	tests.	of Variance, Analysis of One	assignment on
terms.	2- ANOVA: One	Way Classification.	Introduction to
	way	Introduction to Sampling	Analysis of
SO5.2 Apply various types of	J- ANOVA. IWU	Methods, Sampling versus	Variance, Analysis
sampling methods to data	Way	Complete Enumeration,	of One Way

collection.	Simple Random Sampling	Classification.
SOF 2 Create and interpret	with and without replacement,	Introduction to
SO5.3 Create and interpret	Use of Random Number	Sampling Methods,
frequency tables.	Tables for selection of Simple	Sampling versus
	Random Sample.	Complete
	1.1 Introduction to Analysis of	Enumeration.
	Variance	
	1.2 . Analysis of One Way	
	Classification	
	1.3. Introduction to Sampling	
	Methods	
	1.4 Sampling versus Complete	
	Enumeration	
	1.5 Simple Random Sampling	
	with and without replacement	
	1.6 Use of Random Number	
	Tables for selection of Simple	
	Random Sample.	

Assignments:

Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C l)	Laborato ry Lecture (L I)	Sessional Work (SW)	Self Learning (S l)	Total hour (C l + LI+ SW +S l)
01: This course will help students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study.	06	02	01	02	15
02: It can be used to find the best solution to any problem be it simple or complex.	06	08	01	02	15
03: Concept of correlation, various correlation coefficients- Pearson's correlation coefficient, Spearman's rank correlation coefficient, partial correlation coefficient and Multiple correlation coefficient.	06	06	01	02	15

04: To understand the process of hypothesis testing and its significance. Testing of hypothesis using Non-Parametric tests like Median test, Runs test, U test, Kruskal Wallis test etc. and ability to use them judiciously for the testing of given data.		08	01	02	15
05: Apply the different sampling methods for designing and selecting a sample from a population. Compare the pairs of treatment means using different methods when null hypothesis in rejected in ANOVA.	06	06	01	02	15
Total Hours	30	30	05	10	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit title	M	larks Distrib	ution	Total
		R	U	A	Marks
CO-1	This course will help students to	02	02	02	06
	know the applications of				
	Statistics and learn and apply				
	these techniques in the				
	agriculture field of their study.				
CO-2	It can be used to find the best	02	03	03	08
	solution to any problem be it				
	simple or complex.				
CO-3	Concept of correlation, various	02	04	04	10
	correlation coefficients-				
	Pearson's correlation				
	coefficient, Spearman's rank				
	correlation coefficient, partial				

	correlation coefficient and Multiple correlation coefficient.				
CO-4	To understand the process of hypothesis testing and its significance. Testing of hypothesis using Non-Parametric tests like Median test, Runs test, U test, Kruskal Wallis test etc. and ability to use them judiciously for the testing of given data.	03	04	05	12
CO-5	Apply the different sampling methods for designing and selecting a sample from a population. Compare the pairs of treatment means using different methods when null hypothesis in rejected in ANOVA.	04	05	05	14
	Total	13	18	19	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Statistical Methods for Applied Science will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

${\bf Suggested\ Instructional/Implementation\ Strategies:}$

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Demonstration
- 7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	An Outline of Statistical Theory	Goon AM, Gupta MK & Dasgupta B.	The World Press	1977 1 st addition
02	Fundamentals of Statistics	Goon AM, Gupta MK & Dasgupta B	The World Press	1983. First edition
03	Introduction to Mathematical Statistics	Hoel PG	John Wiley	05th Edition 1971
04	An Introduction to Multivariate Statistical Analysis	T.W. Anderson	John Wiley.	3rd Edition 2009
05	Introduction to Mathematical Statistics	Robert V. Hogg, Joseph W. McKean, Allen T. Craig	Hogg	7th Edition 2012

Curriculum Development Team:

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Cos, POs and PSOs Mapping Course Code:- STAT-502

Course Title: - Statistical Methods for Applied Science

Program Specific Outcome

Course	Program O	utcomes								Program Sp	ecific Outcome	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva		al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n thus a sale	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student'	ve crop	alon	and	ement of			knowledge	profitable decisions.			ities.	will affect
	of farming and	s contribu	aspects.	g with	plant				of, and need for	To				futuristic
	farming	tions.		eval	protec tion	agrono mical			sustainable	understand				agricultu
	system in	tions.		uatio	econo	packag			developme	the				re
	India			n	mic	e and			nt in	mechanics				10
	maia			whic	associ	practic			Agricultur	of agri				
				h	ated	es.			e.	Entreprene				
				will	with	• • • • • • • • • • • • • • • • • • • •				urship.				
				prov	farmin					г				
				ed to	g									
				deci	enterp									
				sion	rises.									
				in										
				vari										
				ous										
				part										
				of										

				agric ultur e										
CO1- This	1	2	1	1	1	3	3	3	3	3	1	2	3	3
course will														
help students														
to know the														
applications														
of Statistics														
and learn and														
apply these														
techniques in														
the														
agriculture														
field of their														
study														
CO2 It can	1	2	1	1	1	3	3	3	3	3	1	2	3	3
be used to														
find the best														
solution to														
any problem														
be it simple														
or complex														_
CO3	1	2	1	1	1	3	3	3	3	3	1	2	3	3
Concept of														
correlation,														
various														
correlation														
coefficients-														
Pearson's														
correlation														

coefficient, Spearman's rank correlation coefficient, partial correlation coefficient and Multiple correlation coefficient.														
CO 4. To understand the process of hypothesis testing and its significance. Testing of hypothesis using Non-Parametric tests like Median test, Runs test, U test, Kruskal Wallis test etc. and ability to use them	1	2	1	1	1	3	3	3	3	3	1	2	3	3

judiciously for the testing of given data.													
CO5 Apply the different sampling methods for designing and selecting a sample from a population. Compare the pairs of treatment means using different methods when null hypothesis in rejected in ANOVA.	2	1	1	1	3	3	3	3	3	1	2	3	3

Course Curriculum Map: Statistical Methods for Applied Science

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- This course will help students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1. Box-plot, Descriptive statistics, Exploratory data analysis, Theory of probability, Random variable and mathematical expectation. 1.1, 1.2,1.3,1.4,1.5,1.6	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2 It can be used to find the best solution to any problem be it simple or complex	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 Discrete and continuous probability distributions, Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications. Concept of sampling distribution: chisquare, <i>t</i> and <i>F</i> distributions. Tests of significance based on Normal, chisquare, <i>t</i> and <i>F</i> distributions	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 Concept of correlation, various correlation coefficients-Pearson's correlation coefficient, Spearman's rank	SO3.1 SO3.2 SO3.3		Unit-3. Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations. 1.1, 1.2,1.3,1.4,1.5,1.6	As mentioned in page number

	correlation coefficient, partial correlation coefficient and Multiple correlation coefficient.			
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4. To understand the process of hypothesis testing and its significance. Testing of hypothesis using Non-Parametric tests like Median test, Runs test, U test, Kruskal Wallis test etc. and ability to use them judiciously for the testing of given data.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit 4 Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table 1.1, 1.2,1.3,1.4 1.5,1.6	As mentioned in page number

PO 1,2,3,4,5,6	CO5 Apply the	SO5.1	Unit 5 Introduction to Analysis of As mentioned in page
7,8,9,10,11,12	different sampling	SO5.2	Variance, Analysis of One Way number
	methods for	SO5.3	Classification. Introduction to Sampling
PSO 1,2, 3, 4, 5	designing and		Methods, Sampling versus Complete
	selecting a sample		Enumeration, Simple Random Sampling
	from a population.		with and without replacement, Use of
	Compare the pairs		Random Number Tables for selection of
	of treatment means		Simple Random Sample.
	using different		1.1, 1.2,1.3,1.4 1.5,1.6
	methods when null		
	hypothesis in		
	rejected in		
	ANOVA.		



Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code: PGS502

Course Title: Technical writing and communication.

Pre- requisite: Understanding the principles of various technical writing including thesis,

reviews, abstracts and developing communication skills through the proper

use of language.

Rationale: The basic purpose of technical writing is to convey complex information in a

simple manner. It explains a topic in detail using proper abstract and

citations having communication skills being accessible to a general audience.

Course Outcomes:

PGS 502.1: Learning the various form of scientific writing and implementing skills for Formulation of research based documents.

PGS 502.2: Acquisition of technical communication skill and articulate in English (verbal as writing)

Scheme of Studies:

Board of	Course	Course Title		Scheme of studies(Hours/Week)				
Study	Code		CI	CI LI SW SL Total Study Hours			Credits (C)	
							CI+LI+SW+SL	
Program Core (PCC)	PGS 502	Technical writing and communication.	0	15	2	4	21	0+1

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

ANNX-II

Proposed examination scheme (Marking) as per the recommendation of PG re-structuring 'Committee of Agricultural Education Division, Indian Council of Agricultural Research for M. Sc. Horticulture in Vegetables science 2021-22 onwards

S. Category of			Components of Marks						
No.	Course/Subject	Semester End Examination (External	Mid Term exam (Internal)	Assignment (Internal)	Practical Exam (Internal)				
1	Only Theory Subject Course	50	40 (20+20)	10	-	100			
2	Subject/ Course with theory and Practical	50	30 (15+15)	5 (Practical Based)	15	100			
3	Subject/ Course only Practical	-	-	-	100	100			

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

PGS 502.1: Learning the various form of scientific writing and implementing skills for Formulation of research based documents.

ripproximate from 5					
Item	Approximate Hours				
CI	00				
LI	08				
SW	01				
SL	02				
Total	11				

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 1.1. To understand about various form writing research documents.	Technical writing 1.1 Various form of scientific writing – thesis, technical papers, reviews, manuals etc. 1.2 Various part of thesis and		Enlisting and write description of research communication
SO 1.2. To understand about various technical writing approaches for scientific strengting of research documents.	research communication - Title page - Authorship content page - Preface - Introduction		contents.
SO 1.3. To understand about editing and press reading method to avoid plagiarism.	 Review of literature Material and methods Experimental result Discussion 1.3 citations etc. 1.4 Commonly used abbreviations in the thesis and research communication . 1.5 Illustrations, photography and drawing with suitable captions pagination numbering of tables and illustrations. 1.6 Writing of numbers and 		

dates in scientific write ups.	
1.7 Editing and press reading.	
1.8 Writing of review articles.	

a. Assignments:

- Various part of thesis and research communications.
- Writing of abstract, summaries, précis, citations.
- Commonly used abbreviations in the thesis and research communication.
- Write down the principal of editing and press reading.

b. Mini Project:

c. Other Activities (Specify):

PGS 502.2: Acquisition of technical communication skill and articulate in English (verbal as writing)

P	prominate mound
Item	Approximate Hours
CI	00
LI	07
SW	01
SL	02
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 2.1. To understand the types, forms, tenses clauses and their uses.	Communication skill- 1.1 Grammar (Tenses, part of speed, clauses, punctuation marks) 1.2 Error analysis (common error),		Enlisting and write the description of communication using proper language skills.

	concord, collocation,	
SO 2.2. To understand common errors, punctuation in the sentences.	phonetic, symbols and transcription. 1.3 Accentual pattern: weak forms in connected	
SO 2.3. To understand part of speech or word class and their uses.	speech. 1.4 Participation in group discussion 1.5 Facing of interview.	
SO 2.4. To understand discussion in groups and interviews.	1.6 Presentation of scientific paper.	

a. Assignments:

1 Writing types of clauses.

- 2 Writing the sentences using correct punctuation.
- 3 Writing the types and forms of tenses.

b. Mini Project:

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Sessional	Self	Total hour
	Lecture	Work	Learning	(Cl+SW+Sl)
	(Cl)	(SW)	(Sl)	
	0	2	1	3
PGS 502.1 : Learning the various form of scientific writing and implementing skills for Formulation of research based documents.				
PGS 502.2: Acquisition of technical communication skill and	0	2	1	3

articulate in English (verbal as		
writing)		

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

СО	Unit Titles	Marks Distribution			Total Marks
		R	U	A	Warks
CO 1	Technical writing	00	05	05	10
	1.1 Various form of scientific writing – thesis, technical papers, reviews, manuals etc.				
	1.2 Various part of thesis and research communication	03	03	04	10
	Title pageAuthorship content page				
	- Preface				
	- Introduction				
	- Review of literature				
	- Material and methods				
	- Experimental result	0.0	0.5	0.5	10
	- Discussion	00	05	05	10
1	1.3 citations etc.				
	1.4 Commonly used abbreviations in the thesis and research communication .	03	02	05	10
	1.5 Illustrations, photography and drawing with suitable captions	00	00	10	10
	pagination numbering of tables and illustrations.	00	05	05	10
	1.6 Writing of numbers and dates in	04	02	04	10

	scientific write ups.	03	02	05	10
	1.7 Editing and press reading				
	1.8 Writing of review articles.				
CO 2	Communication skill-				
	1.1 Grammar (Tenses, part of speed, clauses, punctuation marks)	03	02	05	10
	1.2 Error analysis (common error),	02	03	05	10
	concord, collocation, phonetic, symbols and transcription.	04	04	00	08
	1.3 Accentual pattern: weak forms in	05	02	00	07
	connected speech. 1.4 Participation in group discussion	00	05	05	10
	1.5 Facing of interview.1.6 Presentation of scientific paper.	00	05	05	10
	P-P-				

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Technical writing and communication** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Demonstration
- 7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 8. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Spoken English	Barnes and Noble. Robert C. (Ed.).	Flourish Your Language	2005
2	Technical communication	Mike markel Stular A. Selber	Bedford/St. Martins, 12 th edition	2017
3	The Essentials of Technical communication	Elizabeth tebeaux sam dragga.	Oxford university press,4th edition	2017
4	Technical writing prosess	Kieran morgan and sanja spajic	Better on paper publications, 1th edition	2015
5	Developing quality technical information	Moira Mcfadden lanyi, Deirdrelongo	IBM press 3th edition	2014

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Cos, POs and PSOs Mapping Course Code:- PGS 502

Course Title: - Technical writing and communication skill.

Course Outcomes	Program Ou	itcomes								Program Sp	ecific Outcom	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific knowledge of various branches of agronomy will be made specialized and to provide knowledge disseminati on regarding various technique of farming and farming system in India	Wide knowle dge in the concern ing subject which will improve the farmers condition through student's contributions.	Detailed knowled ge regardin g package and practices soil fertilizer and water manage ment of producti ve crop aspects.	Use appr opri ate scie ntifi c meth ods colla bora tion with stati stics alon g with eval uatio n which will proved to	Detail ed knowl edge of cultiva tion practic es, soil, fertiliz ers, water manag ement and plant protec tion econo mic associ ated with farmin g enterp rises.	Create, select and apply an appropriate techniques, resources and modern it tools in improvement of agronomical package and practices.	Student will apply various statistic al method s to analyze their master research work	Student will apply basic concepts in laboratory techniques during their research work	Understan d the impact of the profession al expert solutions in societal and environme ntal contexts, and demonstrat e the knowledge of, and need for sustainable developme nt in Agricultur e.	Enable to recognize and examine the relationshi ps between inputs and outputs in their agricultural field to make effective and profitable decisions. To understand the mechanics of agri Entreprene urship.	Acquainting with basic concepts theories and terminology of Agronomy.	To undertake teaching research and extension activates along with administrative and consultancy services.	Apply research and expertise in resolving the problems of existing farm in the periphery of universities.	To understa nd and analyze the current issues that are occurrin g in local and global agricultu re and how they will affect futuristic agricultu re

				deci sion in vari ous part of agric ultur e										
CO1- Learning the various form of scientific writing and implementing skills for Formulation of research based documents.	1	1	1	1	3	3	1	1	1	1	3	2	3	1
CO2- Acquisition of technical communicati on skill and	1	1	1	1	3	3	1	1	1	1	3	2	3	1

articulate in						
English						
English (verbal as						
writing)						

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Technical writing and communication skill

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
No. PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- Learning the various form of scientific writing and implementing skills for Formulation of research based documents.	SO1.1 SO1.2 SO1.3	Instruction(LI)	Unit-1. Technical writing Various form of scientific writing – thesis, technical papers, reviews, manuals etc. Various part of thesis and research communication - Title page - Authorship content page - Preface - Introduction - Review of literature - Material and methods - Experimental result - Discussion	As mentioned in page number
				citations etc. Commonly used abbreviations in the thesis and	

		research communication.
		Illustrations, photography and drawing with suitable captions pagination numbering of tables and illustrations. Writing of numbers and dates in scientific write ups.
		Editing and press reading. Writing of review articles 1.1,1.2,1.3,1.4,`1.5,1.6,1.7,1.8,
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2-Acquisition of technical communication skill and articulate in English (verbal as writing)	Communication skill- Grammar (Tenses, part of speed, clauses, punctuation marks)Error analysis (common error), concord, collocation, phonetic, symbols and transcription. Accentual pattern: weak forms in connected speech. Participation in group discussion Facing of interview. Presentation of scientific paper. 1.1,1.2,1.3,1.4,1.5,1.6.



AKS University

Faculty of Agriculture Science and Technology Department of Agronomy/Plant Pathology/GPB/Soil Science/Horti. Curriculum of M.Sc.Agri Program

Course Code: PGS 501

Course Title: Library and Information Services

Pre-requisite: Student should have basic knowledge of library because course

aims to familiarize the learners with the basic concept of use of

library services.

Rationale: To impart to the students an understanding of knowledge

classification and the theories of library classification, to develop skills in document classification and content analysis. The course provides the opportunity, ensuring freedom and equal access to information for all members of the community, to educate and enlighten them. To maintain and preserve books, materials and resources with historical, cultural, social, economic and archival value, and other related materials in an organized collection to provide members of the community these materials and enriched

their personal and professional lives.

Course Outcomes:

CO1. Able to understand about various concepts of Library, its functions, objective and connect foundational concepts, theories, and principles of information organization and access to professional contexts.

Scheme of Studies:

Board					Schei	Scheme of studies(Hours/Week)			
ofStudy	Course Code	CourseTitle	Cl	LI	SW	SL	Total StudyHours(CI+L I+SW+SL)	(C)	
		Library and Information Services	0	1	1	1	3	1	

Legend: CI:Class room Instructions (Includes different instructional strategies i.e.

Lecture(L), Tutorial (T) and others),

LI:Laboratory Instruction(Includes Practical performance sin laboratory workshop, field or other locations using different instructional strategies) SW: Sessional Work(includes assignment, seminar, mini project etc.),

SL:Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous

guidance and feedback of teacher to ensure out come of Learning.

Scheme of Assessment:

Theory

				Schem	e of Ass	sessment	(Marks)		
				Progres	sive Ass	sessment	(PRA)		End Semest	Total
Boar d of Stud y	Cou se Cod e	Course Title	Class/Ho me Assignm ent 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Semi nar one (SA)	Class Activi ty any one (CAT	Class Attenda nce (AT)	Total Marks (CA+C T+ SA+CA T+AT)	er Assess ment	Marks (PRA+ ESA)
	PGS 501	Library and Informatio n Services							100	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion

PGS501.1: Able to understand about various concepts of Library, its functions, objective and connect foundational concepts, theories, and principles of information organization and access to professional contexts.

pp-omme	ice mound
Item	Appx
	Hrs.
Cl	0
LI	30
SW	6
SL	3

Total	39

SessionOutcomes (SOs)	Laboratory Instruction (LI) 1 class= 2 hrs	Classroom Instruction (CI)	(SL)
SO1.1Understand the Concept, Definition & Characteristics of Library SO1.2Understand the Importance & Functions of Library SO1.3 Understand the Role of Library and Information Services	Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, CABI Abstracts, etc.); Tracing information from reference sources;		1. How to Accessioning of Books on software 2 How to Books search in Library through the OPAC 3. Difference Between Library and Information Services
	Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; ere sources access methods. 1.1 Introduction to library, 1.2 Types of library, 1.3 Role of library in society 1.4 Role of Education sector, 1.5 Classification scheme, 1.6 Types of Information sources 1.7 Abstracting and indexing services, 1.8 Use of Databases, OPAC 1.9 Computerized library services 1.10 Library Services 1.11 Online Public Access		

Catalogue	
1.12 Types of Information Centers	
1.13 Library Automation	
1.14 Create a Digital Library	
1.15 Use of e resources	

a. Assignments:

- 1. Introduction to library and its services;
- 2. Role of libraries in education, research and technology transfer,
- 3. Classification systems and organization of library;
- 4. Sources of information-, Primary Sources, Secondary Sources and Tertiary Sources;
- 5. Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.);
- 6. Tracing information from reference sources;

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class lecture (CL)	Sessional Work (SW)	Self- Learning (SL)	Total hour (CL+SW+SL)
Able to understand about various concepts of Library, its functions, objective and connect foundational concepts, theories, and principles of				
information organization and access to professional contexts.	30	6	3	39

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

СО	Unit Titles	Marks	ution	Total Marks	
		R	U	A	

CO1	Library and Information Services	30	70	100

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Library and Information Services will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Demonstration
- 7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 8. Brainstorming

Suggested Learning Resources:

Sl. No.	Title	Author	Publisher	Edition and Year
01				
02				

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Cos, POs and PSOs Mapping Course Code:- PGS 501

Course Title: - Library and Information Services

Course	Program Ou	ıtcomes								Program Sp	ecific Outcom	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific knowledge of various branches of agronomy will be made specialized and to provide knowledge disseminati on regarding various technique of farming and farming system in India	Wide knowle dge in the concern ing subject which will improve the farmers condition through student's contributions.	Detailed knowled ge regardin g package and practices soil fertilizer and water manage ment of producti ve crop aspects.	Use appr opri ate scie ntifi c meth ods colla bora tion with stati stics alon g with eval uatio n which will proved to deci sion in vari	Detail ed knowl edge of cultiva tion practic es, soil, fertiliz ers, water manag ement and plant protec tion econo mic associ ated with farmin g enterp rises.	Create, select and apply an appropriate techniq ues, resources and modern it tools in improvement of agrono mical package and practices.	Student will apply various statistic al method s to analyze their master research work	Student will apply basic concepts in laboratory techniques during their research work	Understan d the impact of the profession al expert solutions in societal and environme ntal contexts, and demonstrat e the knowledge of, and need for sustainable developme nt in Agricultur e.	Enable to recognize and examine the relationshi ps between inputs and outputs in their agricultural field to make effective and profitable decisions. To understand the mechanics of agri Entreprene urship.	Acquainting with basic concepts theories and terminology of Agronomy.	To undertake teaching research and extension activates along with administrati ve and consultancy services.	Apply researc h and experti se in resolvi ng the proble ms of existin g farm in the periphe ry of univers ities.	To unders nd and analyze the current issues that are occurring in local and agricular end how the will affect futuris agricular end the current issues that are and how the current issues that are also that ar

				ous part of agric ultur e										
CO1- Able to	1	1	1	1	1	1	3	3	1	1	1	2	1	1
understand														
about various														
concepts of														
Library, its														
functions,														
objective and														
connect														
foundational														
concepts,														
theories, and														
principles of														
information														
organization														
and access to														
professional														
contexts.														
		İ			l	1			1	1	1	1		1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Library and Information Services

POs & PSOs	COs No.&	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning
No.	Titles		Instruction(LI)		(SL)
		SO1.1 SO1.2 SO1.3	•	Unit-1. Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information-Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library	U
	access to professional contexts.			services; Use of Internet including search engines and its resources; ere sources access methods. 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13,1.14,1.15	



AKS University

Faculty of Agriculture Science and Technology

Department of Agronomy

Curriculum of M.Sc Ag Agronomy Program

Course Code: Agron 503

Course Title: Principles and practices of weed management

Pre-requisite: Student should have basic knowledge of weed its characteristics Allelopathic

effect of weed on crop. Students are acquaint with the herbicides and weed

Management practices and Integrated Weed Management.

Rationale: The students should be acquainted with the knowledge of weed its importance

and crop weed competition and weed ecology. Students have basic knowledge of herbicides and principles and practices of weed management practices in different cropping system. This field of study and practice is driven by several

key factors and considerations: Safety, Sustainability, Innovation and

technology, Economic efficiency.

Course Outcomes:

Agron 503.1 Define weeds, its intensity and crop weed competition to make student expert in the weed science.

Agron 503.2 Students may acquire knowledge to herbicide classification based on Chemical, physiological mode and mechanism of action Of herbicides.

Agron 503.3 Students may acquire knowledge about herbicide structure and weed control through use of nanoherbicides and bio-herbicides, myco-herbicides and degradation of herbicide.

Agron 503.4 Student will acquaint knowledge about principles and method of weed control and management.

Agron 503.5 PG students of agronomy will become to expert in integrated weed management practices.

Scheme of Studies:

Category					Schei	me of studi	ies(Hours/Week)	TotalCredits
of	_		Cl	LI	SW	SL	Total	(C)
course	Course	CourseTitle					StudyHours(CI+L	
	Code						+SW+SL)	
	Agro-	Principles and	02	1	1	1	5	3
	503	practices of weed						
	303	management						

Legend: CI: Classroom Instruction(Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction(Includes Practical performances in laboratory workshop, field or other locations

using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacherto ensure outcome

of Learning.

Scheme of Assessment:

Theory

			Scheme of Assessment (Marks)								
					End Semester	Total Marks					
Category of Couse Code	Course Title	Class/ Home Assig nment 5 numb er 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+A T)	Assessme nt (ESA)	(PRA+ ESA)		
Program Core (SDGs)	Agro- 503	Principles and practices of weed manageme nt	15	20	5	5	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Agro 503.1 Define weeds, its intensity and crop weed competition to make student expert in the weed science.

Item	Appx Hrs.
Cl	06
LI	4
SW	1
SL	1
Total	12

Session Outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 Understand the weed	1. Identification	Unit-1. Weed biology,	 principles
biology and ecology of	of important	and ecology and	and methods
weed and its	weeds of	classification, crop-	of weed
characteristic and	different crops	weed competition	control and
importance of weed.	Preparation of	including Allelopathy;	management
	a weed	principles and methods	and different
SO1.2Understand the crop	herbarium	of weed control and	weed indices
weed competition and		classification	
its effect on crop.			

SO1.3 Understand the allelopathy its types and allelopathic effect of weed on crop and crop on weed.	management; weed indices, weed shift in different eco-systems 1.1Introduction to Characteristics of weed and classification of weeds.	
SO1.4 Understand the principles and methods of weed control and different	1. 2 1 Introduction to crop weed competition.	
types of weed management practices. SO1.5 Understand the different types of weed	1.3 Introduction to allelopathy and its effect of weed on crop and crop on weed.	
different types of weed indices like weed control efficiency and weed index. SO1.6 Understand the weed shift in different eco-systems	1.4 Explain the principles and methods of weed control and management 1.5 introduction to different types of weed indices.	
	1.6 Explain the weed shift in different eco-systems	

SW-1 Suggested Sessional Work (SW): Assignments:

What is Weed biology and ecology. Explain classification, crop-weed competition including Allelopathy.

a. Other Activities(Specify):

Collection of weed species in AKS Campus.

Agro 503.2 Students may acquire knowledge to herbicide classification based on Chemical, physiological mode and mechanism of action Of herbicid

Item	AppxHrs.
Cl	06
LI	4
SW	1
SL	1
Total	12

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Understand the herbicide	1. Preparation	Unit-2 Herbicides introduction	1. history and
and concept of herbicide.	of spray	and history of their	development of
	solutions of	development; classification	herbicide.
SO1.2 Understand the	herbicides	based on Chemical, physiological	

development of herbicide in ancient time to modern time.	for high and low-volume sprayers	application and selectivity; mode and mechanism of action Of herbicides.	
SO1.3 Understand the classification of herbicide on the basis of Chemical composition.	2. Calculation of herbicidal requirement	1.1 Introduction to Herbicides and its history	
SO1.4 . Understand the classification of herbicide on the basis of physiological application		1.2 Introduction to Herbicides development.	
SO1.5 Understand the classification of herbicide on the basis of selectivity.		1.3. Explain the classification of herbicide on the basis of Chemical1.4 Explain the classification of herbicide on the basis of chemical.	
SO1.6 Understand the classification of herbicide on the basis of mode and mechanism of action		herbicide on the basis of physiological application 1.5 Explain the classification of herbicide on the basis of selectivity	
		1.6 Explain the classification of herbicide on the basis of mode and mechanism of action Of herbicide	

Assignments:

Classification based on Chemical, physiological application and selectivity mode and mechanism of action of herbicides.

b. Other Activities(Specify):

Agro 503.3 Students may acquire knowledge about herbicide structure and weed control through use of nanoherbicides and bio-herbicides, myco-herbicides and degradation of herbicide.

Item	Appx Hrs.
C1	06
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction	Classroom Instruction (CI)	Self-
(505)	(LI)	(02)	(SL)
SO1.1 Understand the Herbicide structure factors affecting the efficiency of Herbicides. SO1.2 Understand the herbicide formulations, herbicide mixtures, sequential application of Herbicides, and herbicide rotation SO1.3 Understand the use of nanoherbicides and bio-herbicides, mycoherbicides bio-agents, and allelochemicals for control the weed. SO1.4. Understand the movement of herbicides in soil and	Instruction	Unit-3 Herbicide structure - activity relationship; factors affecting the efficiency of Herbicides; herbicide formulations, herbicide mixtures, sequential application of Herbicides, rotation; weed control through use of nano- herbicides and bioherbicides,myco-herbicides bio-agents, and allelochemicals; movement of herbicides in soil and plant, degradation of herbicides in soil and plants; herbicide resistance, residue, persistence and management; development of herbicide resistance in weeds and crops and their management,	Learning
sol.5 Understand the herbicide resistance and its management. Sol.6 Understand the herbicide combination and rotation.		 herbicide combination and rotation. 1.1Introduction to Herbicide structure - activity relationship; factors affecting the efficiency of Herbicides. 1.2 Introduction to herbicide formulations, herbicide mixtures, sequential application of Herbicides, rotation . 1.3. Introduction to weed control through use of nano-herbicides and bio-herbicides,myco-herbicides bio-agents, and allelochemicals. 1.4. Introduction to movement of herbicides in soil and plant, degradation of herbicides in soil and plants 1.5 Introduction to herbicide resistance, residue, persistence and management. 1.6 Introduction to development of herbicide resistance in weeds 	

		herbicide combination and rotation	
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Assignments:

Movement of herbicides in soil and plant, degradation of herbicides in soil and plants herbicide resistance and its mamangement.

c. OtherActivities(Specify):

Agron 511.4 Student will acquaint knowledge about principles and method of weed control and management.

Item	AppxHrs.
C1	06
LI	4
SW	1
SL	1
Total	12

SessionOutcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 Understand the management	1.Weed	Unit-4 Weed management in	1. Weed
of Weed in major crops and	survey in	major crops and cropping	management in
cropping systems.	crops	systems; alien, invasive and	major crops and
	and	parasitic weeds and their	cropping
SO1. 2 Understand the the	cropping	management; weed shifts in	systems; alien,
management of alien, invasive and	systems	cropping systems; aquatic and	invasive and
parasitic weeds.		perennialweed control; weed	parasitic weeds
		control in non-crop area.	and their
	2.Crop-		management.
SO1.3 Understand the weed shifts in	weed	1.1Introduction to Weed	
different types of cropping systems.	competiti	management in major crops and	
	on	cropping systems	
	studies	1.	
SO1.4 . Understand the aquatic weed		1.2. IIntroduction to alien,	
control and their management.		invasive and parasitic weeds	
		and their managemen	
		1.3 .Introduction to weed shifts in	
SO1.5 Understand the perennial		different types of cropping	
weed control and their management.		systems.	
SO1.6 Understand the weed control			

in non-crop area.	1.4 Introduction to aquatic weed control and management
	1.5 Introduction to perennial weed control and management.
	1.6 Introduction to weed control in non-crop area.

Assignments:

weed shifts in cropping systems; aquatic and perennial weed control; weed control in non-crop area

d. OtherActivities(Specify):

Agron 511. 5 PG students of agronomy will become to expert in integrated weed management practices.

Item	AppxHrs.
C1	06
LI	4
SW	1
SL	1
Total	12

SessionOutcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Understand the Integrated	1. Use of	Unit-5 Integrated weed	 Study on
weed management practice.	various	management; recent	robotics,
	types of	development in weed	drones and
SO1.2 Understand the latest	spray	management- robotics, use	aeroplanes
technology for the weed control	pumps and	of drones and aeroplanes,	technology
	nozzles and	organic etc., cost: benefit	for the
	calculation	analysis of weed	weed
SO1.3 Understand the robotics	of swath	Management.	control.
technology methods for the weed control.	width.		
	2. Economics	1.1 Introduction to Integrated	
	of weed	weed management practice	
SO1.4 . Understand the drones	control	for the management of weed.	
technology and aeroplane for the			
weed control.		1.2 . Introduction to latest	
		technology for the weed control	
SO1.5 Understand the weed		and management.	

control through organic methods.	
	1.3 .Introduction to robotics for
SO1.6 Understand the cost:	the weed control.
benefit analysis of weed	
Management.	1.4 Introduction to use of
	drones and aeroplane for the
	weed control.
	1.5 Introduction to weed
	control through organic
	methods.
	1.6 Introduction to cost:
	benefit analysis of weed
	Management.
	Training of the first of the fi

Assignments:

Study on latest technology for the weed control and management.

Other Activities(Specify):

Study on plant growth regulators and their role in sustainability.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lectue (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)		Total hour (Cl+SW+Sl)
Agro 503.1 Define weeds, its intensity and crop weed competition to make student expert in the weed science.	6	4	1	01	12
Agro 503.2 Students may acquire knowledge to herbicide classification based on Chemical, physiological mode and mechanism of action Of herbicides	6	4	1	01	12
Agro 503.3 Students may acquire knowledge about herbicide structure and weed control through use of nano-herbicides and bioherbicides,myco-herbicides and degradation of herbicide.	6	4	1	01	12
Agro 503.4 Student will acquaint knowledge about principles and method of weed control	6	4	1	01	12

and management					
Agro 503.5 PG students of agronomy will become to expert in integrated weed management practices.	6	4	1	01	12
Total Hours	30	20	5	5	60

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles		Marks Dis	stribution	Total
		R	U	A	Marks
CO-1	Weed biology, and ecology and classification, crop-weed competition including Allelopathy; principles and methods of weed control and classification management; weed indices, weed shift in different ecosystems		01	01	05
CO-2	Herbicides introduction and history of their development; classification based on Chemical, physiological application and selectivity; mode and mechanism of action Of herbicides	02	06	02	10
CO-3	Herbicide structure - activity relationship; factors affecting the efficiency of Herbicides; herbicide formulations, herbicide mixtures, sequential application of Herbicides, rotation; weed control through use of nano-herbicides and bioherbicides, myco-herbicides bio-agents, and allele chemicals; movement of herbicides in soil and plant, degradation of herbicides in soil and plants; herbicide resistance, residue, persistence and management; development of herbicide resistance in weeds and crops and their management, herbicide combination and rotation.	03	07	05	15

CO-4	Weed management in major crops and cropping systems; alien, invasive and parasitic weeds and their management; weed shifts in cropping systems; aquatic and perennialweed control; weed control in non-crop area	05	05	05	15
CO-5	Integrated weed management; recent development in weed management-robotics, use of drones and aeroplanes, organic etc., cost: benefit analysis of weed Management.	01	02	02	05
Total		11	26	13	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for principles and practices of weed management to will be held with written examination of 50 marks

Note.Detailed Assessment rubric need to be prepared by the course wise teachers for abovet asks.

Teachers can also design different task sasper requirement, for end semester assessment.

SuggestedInstructional/ImplementationStrategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Visit to field
- 7. Demonstration
- 8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming.

Suggested Learning Resources:

(a)Books:

S. No.	Title	Author	Publisher	Edition& Year
1	Weed science: basics and applications,	das tk.	jain brothers (new delhi).	2008.
2	Recent advances in weed management.	chauhan b and mahajan g	Springer	2014
3	Principles of weed control,	fennimore, steven a and bell, carl.	Weed sci. Soc.Grains, crc press	4th ed, 2014
4	Integrated weed management for sustainable agriculture,	zimdahl rl.	b. D. Sci. Pub.	(ed). 2018

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Cos, POs and PSOs Mapping Course Code:-Agron- 503

Course Title: - Principles And Practices of Weed Management

Course	Program Ou	itcomes								Program Sp	ecific Outcom	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student'	ve crop	alon	and	ement			knowledge	profitable			ities.	will
	of farming	S	aspects.	g	plant	of			of, and	decisions.				affect
	and	contribu		with	protec	agrono			need for	То				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in			uatio	econo	packag			developme	the				re
	India			n	mic	e and			nt in	mechanics				
				whic	associ ated	practic			Agricultur	of agri Entreprene				
				h will	with	es.			e.	urship.				
					farmin					ursnip.				
				prov ed to										
				deci	g enterp									
				sion	rises.									
				in	11303.									
				vari										
				ous										

				part of agric ultur e										
CO1- Define weeds, its intensity and crop weed competition to make student expert in the weed science.	3	3	3	3	3	1	1	1	3	3	1	2	3	1
CO2- Students may acquire knowledge to herbicide classification based on Chemical, physiological mode and mechanism of action Of herbicides	3	3	3	2	3	1	1	1	3	3	1	3	2	1
CO3- Students	3	2	1	3	2	3	1	1	3	3	2	2	1	2

may acquire knowledge about herbicide structure and weed control through use of nanoherbicides and bioherbicides, my co-herbicides and degradation of herbicide.														
CO- 4 Student will acquaint knowledge about principles and method of weed control and management	3	2	1	3	1	3	1	1	1	3	1	3	2	1
CO5- PG students of agronnomy will become to expert in integrated	3	1	2	3	1	3	1	1	1	2	3	1	1	1

weed							
managemen							
t practices.							

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Principles and practices of weed management

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- Define weeds, its intensity and crop weed competition to make student expert in the weed science.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		Unit-1. Weed biology, and ecology and classification, crop-weed competition including Allelopathy; principles and methods of weed control and classification management; weed indices, weed shift in different eco-systems 1.1, 1.2,1.3,1.4,1.5,1.6.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2- Students may acquire knowledge to herbicide classification based on Chemical, physiological mode and mechanism of action Of herbicides	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		Unit-2 Herbicides introduction and history of their development; classification based on Chemical, physiological application and selectivity; mode and mechanism of action Of herbicides. 1.1, 1.2,1.3,1.4,1.5,1.6.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3- Students may acquire knowledge about herbicide structure and weed control through use of nano-herbicides and bioherbicides, mycoherbicides and degradation of herbicide.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		Unit-3 Herbicide structure - activity relationship; factors affecting the efficiency of Herbicides; herbicide formulations, herbicide mixtures, sequential application of Herbicides, rotation; weed control through use of nano-herbicides and bioherbicides, myco-herbicides bioagents, and allele chemicals; movement of herbicides in soil and plant, degradation of herbicides in soil and plants; herbicide resistance, residue,	As mentioned in page number

			persistence and management; development of herbicide resistance in weeds and crops and their management, herbicide combination and rotation. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO- 4 Student will acquaint knowledge about principles and method of weed control and management	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6	Unit 4. Weed management in major crops and cropping systems; alien, invasive and parasitic weeds and their management; weed shifts in cropping systems; aquatic and perennial weed control; weed control in non-crop area. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5- PG students of agronnomy will become to expert in integrated weed management practices.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6	Unit 5 Integrated weed management; recent development in weed management- robotics, use of drones and aeroplanes, organic etc., cost: benefit analysis of weed Management.1.1, 1.2,1.3,1.4 1.5,1.6	As mentioned in page number



Faculty of Agriculture Science and Technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Programme

Course Code: Agron - 504 (2+1)

Course Title: Principles and practices of water management

Pre-requisite:

Students of PG need to know the basic points of water management, available water ofcrops, water need of crops, critical stages of crops for WR, soil plant water relationship its impact on crops and studies what are the role of water in crops etc.

Rationale:

This course is compulsory in agriculture because water is a life besides the utility of water for crops students need to learn water management and different practices how to applied water in crops to obtain maximum WUE.

Course Outcomes:

Agron 504.1P.G. student will become expert in water management to calculate the water use efficiency (WUE).

Agron 504.2 Acquired knowledge about water drainage system

Agron 504.3 Draw suitable figure of 90 ° v, notch to major quantity of flowing irrigation water.

Agron 504.4 To evaluate the performance of tensiometer for determination of moisture tension in experimental field.

Agron 504.5 Acquire knowledge to differentiate irrigation methods, systems and drainage methods.

Scheme of Studies:

Category	Course	Course	Sc	hem	e of s	tudie	es (Hours/Week)	Total
of	Code	Title	Cl	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	Credit
course								S
								(C)
Program	AGRO	Principles and	2	1	1	1	5	3
core	504	practices of water						
(SDGS)		management						

Legend: CI: Class room Instructions (Includes different instructional strategies i.e.

Lecture(L), Tutorial (T) and others),

LI: Laboratory Instruction(Includes Practical performance sin laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work(includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and

feedback ofteachertoensure out come of Learning.

Scheme of Assessment:

Theory

			Scheme of As	sessment (Mark	(s)					
Board of Study	Couse Code	Course Title	Class/Home Assignment 5 number	Class Test 2 (2 best out of 3)10 marks each (CT)	Semin ar one (SA)		Class Attendanc e (AT)	Total Marks (CA+CT+S A+CAT+AT)	Assessment	Total Marks (PRA + ESA)
Program core (SDGS)	AGRO 504	Principl es and practice s of water manage ment	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Sessional Work (SW), and Self-Learning (SL). Which students are familiar through various mode of instruction .As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Agro- 504.1 PG Students has keen interest to know in details about WUE, WR and CSC

PF				
Item	Appx Hrs.			
CI	5			
LI	6			
SW	1			
SL	1			
Total	13			

Session Outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 PG students	1. Determination	Unit-1.Water and its role in	
will become a	of soil	plants; irrigation: definition	1.Prepare a notes
good faculty	moisture	and objectives, water	on water
	percentage by	resources and irrigation	resources in
SO1.2Students gain	gravimetric	development in India and	India
knowledge	method. 2. Determination	concerned state, major	2.study of water
about	of field	irrigation projects, extent of	management
importance of	capacity by	area and crops irrigated in	systems and
water, its role	field method.	India and in different states.	irrigation
in crop growth	3. Determination	1.1. Water and its role in plants	methods
	of soil	1.2.Give introductory remarks in	
SO1.3 Students	moisture	respect of role of water in crops	
acquired a lot	characteristics		
of feed back	curves.	1.2Instruct the students about	
after study of		importance of irrigation in field	
course		crops.	
SO1.4.They		1.3Enlist the water resources in	
acquainted		India	
with familiar		1.4Give short notes on difference	
relations		between catchment & command	
during the		area.	
time of study		1.5 Detail study of irrigation project	
		in India and M.P.	

Assignments:- Definition of irrigation given by inventor scientist with place of invention and its importance in field crops.

a. Other Activities(Specify): To determine the moisture content in soil by use of gravimetric method in field

Agro504.2Students of PG classes will become as a expert to use irrigation system.

Item	Appx Hrs.
CI	05
LI	04
SW	01
SL	01
Total	11

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Students	1. Measurem	Unit-II Field water cycle, water	1.Prepare
understand soil-	ent of soil	movement in soil and	assignment
water - plant		plants; transpiration; soil-	
relationship	moisture	water plant relationships;	in regards to
SO1.2 Students gain	tension by	water absorption by plants;	soil-water-
knowledge for	using	plant response to water stress, crop plant	plant
water absorption	· ·	adaptation to moisture	1
process by plant.	tensiometer	stress condition. Water	relationship.
SO1.3 Students obtain		availability and its	2. Study made
knowledge about	2. Problems/	relationship with nutrient	in the wey
nutrient	2. Problems/	availability and loses.	in the way
availability by	numericals	1.1 Instruction given on	of NUE.
crop plants.	to calculate	hydrological cycle.	
SO1.4. They understand	N D O	1.2 Details instruction brought to	
	N, P_2O_5	students towards soil- water-	
hydrological	requiremen	plant relationship.	
cycle	t of any	1.3 Instruct about soil moisture	
SO1.5. They have to	•	stress condition.	
know	crop	1.4 To give knowledge about	
Scheduling of	through	nutrition translocation process	
irrigation and its	available	in crop plants	
methods.		1.5 Instruct the students of PG how	
	inorganic	to increase NUE.	
	fertilizers		
	fertilizers		

SW-1 Suggested Sessional Work(SW):

Assignments: Prepare assignment in regards to soil-water- plant relationship with suitable figure.

b. Other Activities(Specify): Irrigation practices done by student of PG in the field crops
 Agro504.3 students will become to learn all type of irrigation methods for the purpose of increasing WUE

Approximate Hours

Item	Appx Hrs.
CI	06
LI	04
SW	01
SL	01
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
sol.1 To understand the water need of crops. sol.2 Difference between criteria and scheduling of irrigation. sol.3 Micro irrigation methods sol.4.Micro Plot technique method. sol.5 Students will aquired knowledge in relation to fertigation and herbigation.	 Determinati on of field capacity and permanent wilting point by pressure plate apparatus. Determinati on of hygroscopic coefficient. 	Unit-3 Soil, plant and meteorological factors determining water needs of crops, scheduling, depth and methods of irrigation; micro irrigation systems; deficit irrigation; fertigation; management of water in controlled environments and poly houses. Irrigation efficiency and water use efficiency. 1.1To teach which climatic factor effect the water need of crops& how. 1.2 Study of WUE. 1.3 Plant response to depth of irrigation 1.4 Study of CSC to increase crop productivity. 1.5 To acquired knowledge how drip irrigation applied in poly houses& why. 1.6 Difference between systems and methods of irrigation discussed in details.	1. Students provide practical knowledge during the time of study and they have to prepared assignment. 2. Practical calculation work for WUE.

SW-1 Suggested Sessional Work(SW):

Assignments: Assignment provide the best way of learning activity, students has been completed assignment in favour of irrigation systems & methods.

c. Other Activities(Specify):Some research work activities conducted towards water conservation practices.

Agro504.4Students will become expert to brought his knowledge amongst the farmers after filed practices.

Approximate Hours

Item	Appx Hrs.
CI	05
LI	04
SW	01
SL	01
Total	11

Session Outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 Aquired	1.Determination	Unit-4 Water management of crop and	1.Students learn
knowledge	of	cropping system, quality of	self about
about quality	permanent	irrigation water and	sen about
of irrigation	wilting point	management of saline water for	CWR.
water.	by	irrigation, water use efficiency,	2.Students learn
SO1.2 PG students	sunflower	crop water requirement-	
gain a lot of	pot culture	estimation of ET and effective	WUE.
information	method.	rainfall; water management of	3. They learn self
	2. Determination	the major crops and cropping	•
SO1.3 Adoption of	of hydraulic	systems. Automated irrigation	CSC
crop water	conductivity	system.	
management	of saturated	1.1 To teach the water management of	
system for	soil below	crops.	
crops and	the water	1.2 Explain in details, quality of	
cropping	table by	irrigation water and SWI.	
system.	auger hole	1.3 To instruct about WUE with formula.	
SO1.4.Gain	method.	1.4 Detail study of CWR with formula.	
		1.5 Definition of effective rainfall &	
knowledge for		water management of corps.	
management of saline			
water.			
SO1.5 Studies of			
water			
management			
of major			
crop.			
crop.			

SW-1 Suggested Sessional Work(SW):

Assignments: Assignment prepared during the study of course practical.

d. Other Activities(Specify): Practical study conducted in the field for irrigation of crops.

Agro504.5PG students will become master in water management practices and they have brought knowledge in future amongst the farmers.

Approximate Hours

Item	Appx Hrs.
CI	05
LI	02
SW	01
SL	01
Total	09

Session outcomes (SOs)	Laboratory Instruction	Classroom Instruction (CI)	Self-Learning (SL)
			S
		and details on interception drainage method. 1.5 Study in brief rain water management and its utilization for corp.	

SW-1 Suggested Sessional Work(SW):

Assignments: Prepared assignment in details with suitable figure for different methods of drainage after field visit.

e. Other Activities(Specify): Field visit, visit in progressive farmers field & research farms.

Course Outcomes	Class	Laboratory	Sessional	Self	Total hour
	Lecture	nstruction	Work	Learning	(Cl+SW+Sl)
	(Cl)	(LI)	(SW)	(Sl)	
Agro 504.1P.G. student will become expert in	05	6	01	01	13
water management to calculate the water use					
efficiency (WUE)					
Agro 504.2 Acquired knowledge about water	05	4	01	01	11
drainage system					
Agro 504.3Draw suitable figure of 90 ° v,	06	4	01	01	12
notch to major quantity of flowing irrigation					
water.					
Agron504.4To evaluate the performance of	06	4	01	01	
tensiometer for determination of moisture				-	12
tension in experimental field.					
Agro 504.5Acquire knowledge to differentiate	05	2	01	01	
irrigation methods, systems and drainage				01	9
methods.					
	27	20	05	05	57
Total Hours					

Brief of Hours suggested for the Course Outcome

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles		Marks Distrib		Total Mark
		R	U	A	S
CO-1	Water and its role in plants major irrigation projects, extent of area and crops irrigated in India and in different states	07	02	02	11
CO-2	Field water cycle, water movement in soil and plantsWater availability and its relationship with nutrient availability and loses	05	02	02	09
CO-3	Soil, plant and meteorological factors determining water needs of crops, management of water in controlled environments and	07	02	02	11

	polyhouses. Irrigation efficiency and water use efficiency.				
CO-4	Water management of crop and cropping system, quality of irrigation water water management of the major crops and cropping systems. Automated irrigation system.	05	02	02	9
CO-5	Excess of soil water and plant growth; water management in problem soils, rainwater management and its utilization for crop production.	07	02	01	10
Total		31	10	09	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment Principles and practices of water management will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for abovet asks.

Teachers can also design different task sasper requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Visit to cement plant
- 7. Demonstration
- 8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming.

Suggested Learning Resources:

(a)Books:

S.	Title	Author	Publisher	Edition
No.				&Year
1	Irrigation water management: principles and practice.	Majumdar dk.	Phl learning Private publishers	2014
2	Irrigation: theory and practice.	michael am.	Vikas publ	1978.
3	Principles of crop production	reddy sr.	Kalyani publ	2000.

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Cos, POs and PSOs Mapping Course Code:-Agron- 504

Course Title: - Principles And Practices of Water Management

Course	Program Ou	itcomes								Program Specific Outcome				
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student'	ve crop	alon	and	ement			knowledge	profitable			ities.	will
	of farming	S	aspects.	g	plant	of			of, and	decisions.				affect
	and	contribu		with	protec	agrono			need for	То				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in			uatio	econo	packag			developme	the				re
	India			n	mic .	e and			nt in	mechanics				
				whic	associ	practic			Agricultur	of agri				
				h	ated	es.			e.	Entreprene				
				will	with					urship.				
				prov	farmin									
				ed to deci	g									
				sion	enterp rises.									
				in	11868.									
				vari										
				ous										
				ous										

				part of agric ultur e										
co1- P.G. student will become expert in water management to calculate the water use efficiency (WUE)	3	3	3	3	3	1	1	1	3	3	1	2	3	1
CO2- Acquired knowledge about water drainage system	3	3	3	2	3	1	1	1	3	3	1	3	2	1
CO3- Draw suitable figure of 90 ° v, notch to major quantity of flowing irrigation water.	3	2	1	3	2	3	1	1	3	3	2	2	1	2
CO4- To evaluate the	3	2	1	3	1	3	1	1	1	3	1	3	2	1

performance														
of														
tensiometer														
for														
determinatio														
n of moisture														
tension in														
experimental														
field.														
CO5-	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate irrigation	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate irrigation methods,	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate irrigation methods, systems and	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate irrigation methods,	3	1	2	3	1	3	1	1	1	2	3	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Principles and practices of water management

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1- P.G. student	SO1.1		Unit-1. Water and its role in plants;	As mentioned in page
7,8,9	will become expert	SO1.2		irrigation: definition and objectives, water	number
PSO 1,2, 3, 4, 5	in water	SO1.3		resources and irrigation development in	
	management to	SO1.4		India and concerned state, major	
	calculate the water			irrigation projects, extent of area and	
	use efficiency			crops irrigated in India and in different	
	(WUE)			states	
		0011		1.1, 1.2,1.3,1.4,1.5,	
PO 1,2,3,4,5,6	CO2- Acquired	SO1.1		Unit-2 Field water cycle, water movement	As mentioned in page
7,8,9	knowledge about	SO1.2		in soil and plants; transpiration; soil-water	number
	water drainage	SO1.3		plant relationships; water absorption by	
PSO 1,2, 3, 4, 5	system	SO1.4		plants; plant response to water stress, crop	
		SO1.5		plant adaptation to moisture stress	
		SO1.6		condition. Water availability and its	
				relationship with nutrient availability and loses	
				loses	
				1.1, 1.2,1.3,1.4,1.5,	
PO 1,2,3,4,5,6	CO3- Draw	SO1.1		Unit-3 Soil, plant and meteorological	As mentioned in page
7,8,9	suitable figure of	SO1.2		factors determining water needs of	number
	90 ° v, notch to	SO1.3		crops, scheduling, depth and	
PSO 1,2, 3, 4, 5	major quantity of	SO1.4		methods of irrigation; micro	
	flowing irrigation	SO1.5		irrigation systems; deficit irrigation;	
	water.			fertigation; management of water in	
				controlled environments and poly	
				houses. Irrigation efficiency and	
				no assest in igation childreney and	

PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO4- To evaluate the performance of tensiometer for determination of moisture tension in experimental field.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	unit 4. Water management of crop and cropping system, quality of irrigation water and management of saline water for irrigation, water use efficiency, crop water requirement- estimation of ET and effective rainfall; water management of the major crops and cropping systems. Automated irrigation system. 1.1, 1.2,1.3,1.4 1.5,	As mentioned in page number
PO 1,2,3,4,5,6	CO5- Acquire	SO1.1	Unit 5 Excess of soil water and plant	As mentioned in page
7,8,9,10,11,12	knowledge to	SO1.2	growth; water management in problem	number
	differentiate	SO1.3	soils, drainage requirement of crops and	
PSO 1,2, 3, 4, 5	irrigation methods,	SO1.4	methods of field drainage, their layout and spacing; rainwater management and	
	systems and drainage methods.	SO1.5	its utilization for crop production 1.1, 1.2,1.3,1.4 1.5,	



AKS University

Faculty of Agriculture Science and Technology Department of Agronomy

Curriculum of M.Sc.(Ag), Department of Agronomy

Course Code: Agron- 513

Course Title: Principles and Practices of Organic Farming

Pre-requisite: Student should have basic knowledge of organic farming system, concept of

sustainable agriculture. Organic farming, principles and its scope in India.

Rationale: The students should be acquainted with the knowledge of organic farming systems

and patterns refer to the types and farming system. They are involved in sustainable agriculture as they to maintain soil fertility and physical condition too and to prevent pests and diseases further heal so maintaint the ecological balance, and ensure efficient use of resources such as water and nutrients. This field of study and practice

is driven by several key factors and considerations: Safety, Sustainability, Innovation

and technology, Economic efficiency.

Course Outcomes:

Agron-513.1 Student may become expert in organic farming as well as about the organic production technology for pushing up the field through organic farming.

Agron-513.2 The knowledge gained by student through this course will be use in making decision so nnutrient dose, choice of manures and method of application etc.

Agron-513.3 Student will get to know about different processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.

Agron-513.4 Student will know different cropping and farming system like integrated farming system. To get knowledge on sustainable agricultural practices such as organic farming.

Agron- 513.5 P.G. student will able to acquaint with the modern knowledge about, certification, labelling and accreditation procedure for organic farming.

Scheme of Studies:

Board of					Sche	meofstudi	ies(Hours/Week)	TotalCred
Study	C		Cl	LI	SW	SL	TotalStudyHour	its (C)
	CourseCode	CourseTitle					S	
							(CI+LI+SW+SL)	
m Core	AGRON- 513	Principles and Practices of Organic Farming	3	1	1	1	6	3

Legend: CI:ClassroomInstruction(Includesdifferentinstructionalstrategiesi.e.Lecture(L)andTutorial (T)andothers),

LI:LaboratoryInstruction(IncludesPracticalperformancesinlaboratoryworkshop,fieldorotherlocatio nsusing different instructional strategies)

SW:SessionalWork(includes assignment,seminar,miniproject etc.),

SL:SelfLearning,

C: Credits.

Note: SW & SL has to beplanned and performed underthe continuous guidance and feedback ofteacherto ensure

outcome of Learnin

SchemeofAssessment:

Theory

						Schen	neofAssessmer	nt(Marks)		
					Progre	essiveAss	sessment(PRA)	End Semes	
Boardof Study	Cou seC ode	CourseTitl e	Class/ Home Assig nment 5num ber3 marks eac h(C A)	ClassT est2 (2bestout of3) 10mar kseach (CT)	Semi naro ne (SA)	Clas sAct ivity anyo ne (CAT)	Class Attendance (AT)	TotalMarks (CA+CT+SA+CAT +AT)	t er Assess ment (ESA)	Total Mark s (PRA + ESA)
Progra m Core (SDGs)	AG R ON- 513	Principles and Practices of Organi c Farming	15	20	5	5	5	50	50	100

Course-CurriculumDetailing:

This coursesy llabusillustrates the expected learning achievements,both at the course and session levels,which students are anticipated to accomplish through various modes of instruction including Classroom Instruction(CI),Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

AGRON-513.1Student may be comeexpertinorganicfarmingaswellasabouttheorganicproduction technology for pushing up the field through organic farming.

ApproximateHours

Item	Appx Hrs.
Cl	5
LI	6
SW	1
SL	2
Total	14

SessionOutcomes	Laborato	ClassroomInstruction (CI)	Self-
(SOs)	ry Instructio n (LI)		Learnin g (SL)
SO1.1UnderstandtheOrganic farming systems. SO1.2Understandtheprinciples and its scope of organic farming. SO1.3 Understand the taken by Government(central/state),NGOs. SO1.4 Understand the other Organizations for promotion of organic agriculture.		Unit-1. Organic farming - concept and definition, its relevance to india and global agriculture and future prospects; principles of organic agriculture; organics and farming standards; organic farming and sustainable agriculture; selection and conversion of land, soil and water management - land use, conservation tillage; shelter zones, hedges, pasture management, agronforestry. 1.1 Introduction to organic farming system and its benefit. 1.2 Indices and principles and its scope of organic farming. 1.3 Introduction then taken by Government (central/state), NGOs. 1.4 introduction to assessment of land use. 1.5 Introduction to assessment of land use.	farming system and know the

SW-1SuggestedSessionalWork(SW):

Assignments:

What is Organic farming systems?definition ,indices and its importance and physical resources and its managemen a. Other Activities(Specify):

Research on most suitable organic farming systems for the Satna Region.

AGRON-513.2 P.G. student will able to acquaint with the modern knowledge about, certification, labelling and accreditation procedure for organic farming.

Approximate Hours

Item	AppxHrs.
Cl	06
LI	8
SW	2
SL	1
Total	17

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self- Learning (SL)
SO1.1UnderstandtheConceptof sustainability in organic farming systems and farming systems. SO1.2 Understand the Organic farming and water use efficiency and farming systems SO1.3 Understand the nutrient recycling, organic residues, organic manures, composting, soil biota. SO1.4. Understand green manures, bio-fertilizers and biogas technology.	1- efficient use of biofertilizers, technique of treating legume seeds with rhizobium. 2- Cultures, use of azotobacter, azospirillum, and psb cultures in field.	Unit-2 Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures, bio-fertilizers and biogas technology. 1.1 Introduction to Concept of sustainability intercropping systems and farming systems. 1.2 The nutrient recycling, organic residues, organic residues, organic manures.	1.Concept of organic farming systems and farming systems. in Satna region.
		residues, organic manures, composting, soil biota.	

SO1.5 Understand the decomposition	3- visit to a	1.3 .production potential under	
of organic residues, earth worms and	bio gas	Organic nutrient resources.	
vermicompost.	plant	1.4 production potential green	
	4- visit to an	manures,bio-fertilizers and biogas	
	organic farm	technology.	
		1.5 Production potential under fortification.	
		1.6 The decomposition of organic	
		residues, earthworms and	
		vermicompost.	

SW-1SuggestedSessionalWork(SW):

Assignments:

Concept of sustainability intercropping systems and farming systems, scope and Objectives production potential under different cropping system.

b. OtherActivities(Specify):

Research on most suitable organic farming for the Satna Region.

AGRON-513.3 Students will know different cropping and farming system like integrated farming system. To get knowledge on sustainable agricultural practices such as organic farming.

ApproximateHours

Item	Appx Hrs.
Cl	06
LI	4
SW	1
SL	1
Total	12

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self-Learning (SL)
sol.1Understand the Choice of crops and varieties in organic farming. Sol.2Understand the allelopathic effects of weed on crop, weed on crop and crop on weed. Sol.3Understand the multiple and relay cropping systems. Sol.4.Understand the role of intercropping in relation to maintenance of soil. Sol.5Understand the research need on sustainable agriculture	1- Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management. 2- Cost of organic production system.	Unit-3 Farming systems, selection of crops and crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity. 1.1 Introduction to Choice of crops and varieties in organic farming. 1.2 Introduction to allelopathic and its effects on crop. 1.3 Introduction to the multiple and relay cropping systems. 1.4 Multi-storied cropping and yield stability in intercropping 1.5 Role of disease and weed management under organic mode of production. 1.6 New research need on sustainable agriculture and new innovation on sustainable agriculture.	1.Study of insect, pest, disease and weed management under organic mode of production in Sustainable agriculture.

SW-1Suggested Sessional Work (SW):

Assignments:

Role of non-monetary Inputs and low cost technologies; research need on sustainable agriculture

c. OtherActivities(Specify):

New Research on sustainable agriculture.

AGRON-513.4Studentwillgettoknowaboutdifferentprocessingtechniquesofagriculturalwaste products as NADED, FYM, Vermicompost etc

ApproximateHours

Item	AppxHrs.
Cl	04
LI	4
SW	1
SL	1
Total	10

SessionOutcomes (SOs)	Laboratory Instruction	ClassroomInstruction (CI)	Self-Learning (SL)
	(LI)	, ,	` /
SO1.1Understand Control of weeds,	1- Cost of	Unit-4 Control of weeds, diseases	1. Study on crop
diseases and insect pest management.	organic	and insect pest management,	diversification and
	production	biological agents and	importance of organic
SO1.2 Understand the organic farming	system.	pheromones, bio-pesticides.	farming for the
and role for organic farming to maintain soil Fertility. SO1.3Understand the biological agents	2- Post harvest	1.1 Introducing to Control of weeds, diseases and insect pest	sustainable agriculture.
and pheromones, bio- pesticides.	management.	management.	
SO1.4 .Understand the fertilizer Use in intensive organic farming system.		1.2 organic farming and role of organic farming to maintain soil Fertility. 1.3 The biological agents and	
SO1.5Understand the advanced nutritional tools for big data analysis		pheromones, bio-pesticides. 1.4 Introduction to management of	
and interpretation.		crop residue and nutrient use efficiency.	

SW-1 Suggested Sessional Work (SW) :

Assignments:

d. Operational Control of weeds, diseases and insect pest management, biological agents and pheromones, biopesticides of organic farming.

OtherActivities(Specify):

Research on weeds, diseases and insect pest management.

AGRON-513.5Theknowledgegainedbystudentthroughthiscoursewillbeusefulin making decisions on nutrient dose, choice of manures and method of application etc.

ApproximateHours

AppxHrs.
04
4
1
1
10

SessionOutcomes (SOs)	Laboratory Instruction	ClassroomInstruction (CI)	Self- Learning
SO1.1UnderstandtheProcessingof	1- quality	Unit-5 Control of weeds, diseases	1. Study on
organic farming. SO1.2Understandthelevelingof organic farming.	stanuarus.	and insect pest management, biological agents and pheromones, bio-pesticides. 1.1Introduction to Processing of	Processing, leveling, economic considerations and viability, marketing
SO1.3Understandthemarketingand export of organic farming. SO1.4. Understand the economic considerations and viability, marketing of organic products.	and accreditation. 2-Procedures for farm produce from organic farms.	organic farming. 1.2.Introduction the leveling of organic farming. 1.3Introduction marketing and export of organic farming.	and export potential of organic products.
		1.4Introduction to the economic considerations and viability, marketing of organic products.	

SW-1Suggested Sessional Work (SW):

Assignments: Processing, leveling, economic considerations and viability, marketing and export potential of organic products

e. OtherActivities(Specify):

Study on Processing, leveling, economic considerations and viability, marketing and export of organic materials.

Brief of Hours suggested for the Course Outcome

CourseOutcomes	Class Lectur e (Cl)	Laborato ry Instructio n (LI)	Sessional Work (SW)	Self Learning (Sl)	Totalhou r (Cl+SW+ Sl)
AGRON- 513.1 Student may become expert in organic farming as well as about the organic production technology for pushing up the field through organic farming.	5	6	1	2	14
AGRON- 513.2 The knowledge gained by student through this course will be useful in making decisions on nutrient dose, choice of manures and method of application etc.	6	8	2	1	17
AGRON-513.3Studentwillgettoknowaboutdifferent processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.	6	4	1	1	12
AGRON- 513.4 Student will know different cropping and farming system like integrated farming system. To get knowledge on sustainable agricultural practices such As organic farming.	4	4	1	1	10
AGRON- 513.5 P.G. student will able to acquaint with the modern knowledge about, certification, labelling and accreditation procedure for organic farming.	4	4	1	1	10
Total Hours	25	26	6	6	63

Suggestion for End Semester Assessment

CO	UnitTitles	Ma	arks Dis	tribution	Total	
		R	U	A	Marks	
CO-1	Unit-1. Organic farming - concept and definition, its relevance to india and global agriculture and future prospects; principles of organic agriculture; organics and farming standards; organic farming and sustainable agriculture; selection and conversion of land, soil and water management-land use, conservation tillage; shelter zones, hedges, pasture management, agron-forestry.	03	01	01	05	
CO-2	Unit-2 Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures, bio-fertilizers and bio gas technology.		06	02	10	
CO-3	Unit-3Farming systems, selection of crops and crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.	03	07	05	15	
CO-4	Unit-4Control of weeds, diseases and insect pest management, biological agents and pheromones, biopesticides.	-	10	05	15	
CO-5	Unit-5 Socio-economic impacts; marketing and export potential: inspection, certification, labeling and accreditation procedures ;organic farming and national economy.	03	02	-	05	
Total		11	26	13	50	

Legend: R:Remember, U:Understand, A:Apply

 $The end of semester assessment for Introduction to principles and practices of organic farming\ will be held\ with\ written\ examination\ of\ 50\ marks$

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as perrequirement, for ends emester assessment.

SuggestedInstructional/ImplementationStrategies:

- 1. ImprovedLecture
- 2. Tutorial
- 3. CaseMethod
- 4. GroupDiscussion
- 5. Visittofarm/ field
- 6. Demonstration

SuggestedLearning Resources:

(a)Books:

S. No.	Title	Author	Publisher	Edition& Year
1	Organic farming	Lampinn	lpswitch,uk	1990
2	Organic farming—theory and practice.	Palaniappansp &ananduraik.		1999
3	Hand book of organic farming	SharmaA	Agronbios	2002
4	Soil microbiology	Subbaraons	Oxford&ibh.	2002
5	A text book of environmental sciences	Trivedirn.	anmolpubl.	1993
6	Organic farming and sustainable agriculture.	Veereshgk, shivashankar k&suiglacharma.		1997

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Cos, POs and PSOs Mapping Course Code:-Agron- 513 Course Title: - Principles and Practices of Organic Farming

Course	Program C	Outcomes								Program S	pecific Outco	me		
Outcomes	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create	Student	Student	Understa	Enable to	Acquaintin	То	Apply	То
	knowledg	knowle	knowled	appr	ed	, select	will	will apply	nd the	recognize	g with	undertake	researc	underst
	e of	dge in	ge	opri	know	and	apply	basic	impact of	and	basic	teaching	h and	and and
	various	the	regardin	ate	ledge	apply	various	concepts	the	examine	concepts	research	experti	analyze
	branches	concer	g	scie	of	an	statistic	in	professio	the	theories	and	se in	the
	of	ning	package	ntifi	cultiv	approp	al	laboratory	nal expert	relationshi	and	extension	resolvi	current
	agronomy	subject	and	С	ation	riate	method	techniques	solutions					
	will be	which	practice	met	practi	techni	s to	during	in	ps	terminolog	activates	ng the	issues
	made	will	s soil	hod	ces,	ques,	analyze	their	societal	between	y of	along with	proble	that are
	specialize	improv	fertilizer	S 11	soil,	resour	their	research	and	inputs and	Agronomy.	administrat	ms of	occurrin
	d and to	e the	and	coll	fertili	ces	master	work	environm	outputs in		ive and	existin	g in
	provide	farmers	water	abor	zers,	and	researc		ental	their		consultanc	g farm	local
	knowledg	conditi	manage	atio	water	moder n it	h work		contexts,	agricultur		y services.	in the	and
	e disseminat	on throug	ment of producti	n with	mana	tools			demonstr	al field to			periph	global
	ion	h	ve crop	stati	geme nt and	in			ate the	make			ery of	agricult
	regarding	student	aspects.	stics	plant	impro			knowledg					
	various	's	aspects.	alon	prote	vemen			e of, and	effective			univer	ure and
	technique	contrib			ction	t of			need for	and			sities.	how
	of farming	utions.		g with	econo	agrono			sustainabl	profitable				they
	and	utions.		eval	mic	mical			e	decisions.				will
	farming			uati	associ	packag			developm	То				affect
	system in			on	ated	e and			ent in	understan				futuristi
	India			whi	with	practic			Agricultu	d the				С
				ch	farmi	es.			re.	mechanics				agricult
				will	ng									_
				prov	enter					of agri				ure
				ed	prises					Entrepren				

				to deci sion in vari ous part of agri cult ure						eurship.				
Co1 - Student may become expert in organic farming as well as about the organic production technology for pushing up the field through organic farming.	3	3	3	3	3	2	1	1	3	3	1	2	3	2
Co2 -The knowledg e gained by student throughth iscoursew illbeusefu linmaking	3	3	3	2	3	1	1	1	3	3	1	3	2	2

decisions on nutrient dose, choice of manures and method of applicatio n etc.														
Co3 - Studentwi llgettokno waboutdif ferent processin g technique s of agricultur al waste products as NADED, FYM, Vermico mpost etc.	2	2	2	3	2	3	1	1	3	3	2	2	1	2
Co4 Student will know different cropping and	3	2	1	3	1	3	1	1	1	3	1	3	2	1

			1											
farming														
system														
like														
integrated														
farming														
system.														
To get														
knowledg														
e														
onsustain														
ableagric														
ulturalpra														
cticessuch														
asorganic														
asorganic farming.														
Co5 -P.G.	3	1	2	3	1	3	1	1	1	2	3	1	1	1
student														
will able														
to														
acquaint														
with														
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ion														
procedure														
for														
organic														
farming.														

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Principles and Practices of Organic Farming

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction	Self
No.			Instruction(LI)	(CI)	Learning
					(SL)
PO 1,2,3,4,5,6	Co1 - Student may become expert in organic farming	SO1.1		Unit-1. Organic farming -	As
7,8,9	as well as about the organic production technology for	SO1.2		concept and definition, its	mentioned in
PSO 1,2, 3, 4,	pushing up the field through organic farming.	SO1.3		relevance to india and	page number
5		SO1.4		global agriculture and	
				future prospects; principles	
				of organic agriculture; organics and farming	
				standards; organic farming	
				and sustainable agriculture;	
				selection and conversion of	
				land, soil and water	
				management - land use,	
				conservation tillage; shelter	
				zones, hedges, pasture	
				management, agron-	
				forestry.	
DO 1 2 2 4 5 6		001.1		1.1, 1.2,1.3,1.4.	Α.
PO 1,2,3,4,5,6	Co2 -The knowledge gained by student through this course will be use ful in making decision nutrient	SO1.1		Unit-2 Organic farming	As
7,8,9	dose, choice of manures and method of application	SO1.2		and water use efficiency;	mentioned in
	etc.	SO1.3		soil fertility, nutrient	page number
PSO 1,2, 3, 4,	cic.	SO1.4		recycling, organic	
5		SO1.5		residues, organic	
				manures, composting,	
				soil biota and	
				decomposition of organic	
				residues, earthworms and	
				vermicompost, green	
				manures, bio-fertilizers	

PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4,	Co3 –Student will get to know about different processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	and biogas technology. 1.1, 1.2,1.3,1.4,1.5. Unit-3 Farming systems, selection of crops and crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity. 1.1, 1.2,1.3,1.4,1.5,	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	Co4 Student will know different cropping and farming system like integrated farming system. To get knowledge on sustainable agricultural practices such As organic farming.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit 4. Control of weeds, diseases and insect pest management, biological agents and pheromones, bio-pesticides. 1.1, 1.2,1.3,1.4 1.5.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	Co5 -P.G. student will able to acquaint with the modern knowledge about, certification, labeling and accreditation procedure for organic farming.	SO1.1 SO1.2 SO1.3 SO1.4	Unit 5 Control of weeds, diseases and insect pest management, biological agents and pheromones, bio-pesticides. 1.1, 1.2,1.3,1.4.	As mentioned in page number

AKS University

Faculty of Agriculture Science and technology
Department of Agronomy
Curriculum of M.Sc Ag Agronomy Program

Course Code: Agron 512

Course Title: Dry land farming and watershed management (2+1)

Pre-requisite: Student should have specific knowledge of crops, Dry land

farming and watershed management

Rationale: The students should be acquainted with the knowledge of Crops

and patterns refer to the types and sequences of crops that are grown. They are involve in sustainable agriculture as they to maintain soil fertility and physical condition too and to prevent pests and diseases further the also maintain the ecological balance, and ensure efficient use of resources such as water and nutrients. This field of study and practice is driven by several key factors and considerations: Safety, Sustainability, Innovation and

technology, Economic efficiency.

Course Outcomes:

Agron 512.1. Students will become to define dryland farming and its constraints.

Agron 512.2 students will become to differentiate dryland farming and rainfed farming.

Agron 512.3. Pg students acquainting knowledge to calculate catchment and command area.

Agron 512.4 students of pg able to evaluate concept of conservation of tillage.

Agron 512.5. Students will become as expert to design water harvesting tank under the watershed management technology.

Scheme of Studies:

Category	Course				Schei	Scheme of studies(Hours/Week)		
of	Code		Cl	LI	SW	SL	Total Study	(C)
course		Course Title					Hours(CI+LI+SW	
				_			+SL)	_
Program	Agron	Dry land farming and	2	0	1	1	4	2
Core	512	watershed management						
(SDGs)	312							
(====)								

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory work shop, field or other locations using different instructional strategies)

SW: Sessional Work(includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

	Scheme of Assessment (Marks)				(Marks)					
					Progr	essive Asse	ssment (PRA)		End Semester Assessm	Total Marks
Board of Study Couse Code C	Course Title	Class/H ome Assignm ent 5 number	Class Test 2 (2 best out of 3) 10 marks	Seminar one	Class Activit y any one	Class Attendance	Total Marks	ent		
			3 marks each (CA)	each (CT)	(SA)	(CAT)	(AT)	(CA+CT+SA+CAT+A T)	(ESA)	(PRA+ ESA)
Program Core (SDGs)	Agron 512	Dry land farming and watershed manageme nt	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Agron 512.1. Students will become to define dryland farming and its constraints.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	06
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
SO1.1 Students will become to define dryland farming SO1.1 Dryland farming Constraints.	1.Method of seed priming. 2. Determination of moisture content of germination of important dryland crops 3.Determination of relative water content and saturation deficit of leaf	Unit i Definition, concept and characteristics of dry land farming; dry land versus rainfed farming; significance and dimensions of dry land farming in indian agriculture. 1.1 Definition, concept 1.2 characteristics of dry land farming; 1.3 dry land versus rainfed farming; 1.4 significance 1.5 dimensions of dry land farming 1.6 dimensions of dry land farming in indian agriculture.	1. Definition, concept characteristics of dry land farming

SW-1 Suggested Sessional Work (SW):

Assignments:

What is Cropping systems? definition, indices and its importance and physical resources and its management in cropping system.

a. OtherActivities(Specify):

Research on most suitable Cropping systems for the Satna Region.

Agron 512.2 students will become to differentiate dryland farming and rainfed farming.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	06
SW	1
SL	1
Total	14

Session Outcomes Laboratory	Classroom Instruction	Self-
-----------------------------	-----------------------	-------

(SOs)	Instruction (LI)	(CI)	Learning (SL)
SO1.1 students will become to differentiate dryland farming SO1.2 students will become to differentiate rainfed farming.	1.Moisture stress effects and recovery behaviour of important crops 2. estimation of potential et by thornthwaite method 3. estimation of reference et ny penman monteith method	Unit ii Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions. 1.1Soil and climatic parameters 1.2 special emphasis on rainfall 1.3characteristics; constraints limiting 1.4crop production in dry land areas; types of drought, 1,5characterization of environment for water availability; 1.6crop planning for erratic and aberrant weather conditions.	1. crop production in dry land areas; types of drought,

SW-1 Suggested Sessional Work (SW):

Assignments:

Concept of sustainability in cropping systems and farming systems, scope and Objectives production potential under different cropping system.

b. OtherActivities(Specify):

Research on most suitable intercropping for the Satna Region.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	06
SW	1
SL	1
Total	14

Session Outcomes	Laboratory Instruction	Classroom Instruction (CI)	Self-Learning (SL)
(SOs)	(LI)		
SO1.1 students acquainting knowledge to calculate catchment SO1.2 students acquainting knowledge to calculate command area.	1.Classification of climate by thornthwaite method (based on moisture index, Humidity index and aridity index) 2.Classification of climate by koppen method 3. Estimation of water balance by thornthwaite method	Unit iii- Stress physiology and resistance to drought, adaptation of crop plants todrought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather Conditions. 3.1 Stress physiology 3.2 Resistance todrought, 3.3 Adaptation of crop plants to drought, 3.4 Drought management strategies; 3.5 Preparation of appropriate cropplans for dry land areas; 3.6 Mid contingent plan for aberrant weather Conditions.	1 adaptation of crop plants todrought,

SW-1 Suggested Sessional Work (SW):

Assignments:

Role of non-monetary Inputs and low cost technologies; research need on sustainable agriculture

c. Other Activities(Specify):

New Research on sustainable agriculture.

Agron 512.4 students of pg able to evaluate concept of conservation of tillage.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	06
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 students of pg able to evaluate concept of tillage. SO1.2 students of pg able to evaluate concept of conservation of tillage.	1. assessment of drought 2.estimation of length of growing period 3. estimation of probability of rain and crop planning for different drought condition	Unit iv- Tillage, tilth, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use. 4.1 Tillage, tilth, 4.2 frequency and depth of cultivation, 4.3 compaction in soil tillage; 4.4 concept of conservation tillage; 4.5 tillage in relation to weed control and moisture conservation; 4.6 techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use.	1. Tillage in relation to weed control and moisture conservation.

SW-1 Suggested Sessional Work (SW):

Assignments:

Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency

d. OtherActivities(Specify):

Research on nutrient use efficiency. .

Agron 512.5. Students will become as expert to design water harvesting tank under the watershed management technology.

Approximate Hours

Item	Appx Hrs.		
Cl	06		
LI	06		
SW	1		
SL	1		
Total	1./		

Session Outcomes	Laboratory	Classroom Instruction		Self-Learning	
(SOs)	Instruction	(CI)		(SL)	
	(LI)				
SO1.1 Students will become as expert to design water harvesting tank under the SO1.2Students will become as expert to watershed management technology.	1.spray of anti- transpirants and their effect on crops 2.water use efficiency 3. Visit to dryland research stations and watershed projects	Unit v- Concept of watershed resource management, problems, approach and components. 5.1 Concept of watershed 5.2 Resource of watershed 5.3 Management of watershed 5.4 Problems of watershed 5.5 Approach of watershed 5.6 Components of watershed	water	gement, of	

SW-1 Suggested Sessional Work (SW):

Assignments:

Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency

e. OtherActivities(Specify):

Research on nutrient use efficiency. .

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+ Sl)
Agron 512.1. Students will become to define dryland farming and its constraints.	6	6	1	14
Agron 512.2 students will become to differentiate dryland farming and rainfed farming.	6	6	1	14
Agron 512.3. Pg students acquainting knowledge to calculate catchment and command area.	6	6	1	14
Agron 512.4 students of pg able to evaluate concept of conservation of tillage.	6	6	1	14
Agron 512.5. Students will become as expert to design water harvesting tank under the watershed management technology.	6	6	1	14
Total Hours	30	30	5	70

Suggestion for End Semester Assessment

CO	Unit Titles	M	arks Dis	tribution	Total	
		R	U	A	Marks	
CO-1	Unit i —	03	01	01	05	
	Definition, concept and characteristics of dry land farming; dry land versus rainfed farming;					
	significance and dimensions of dry land farming in indian agriculture.					
CO-2	Unit ii	02	06	02	10	
	Soil and climatic parameters with special emphasis on rainfallcharacteristics; constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions.					
CO-3	Unit iii-	03	07	05	15	
	Stress physiology and resistance to drought, adaptation of crop plants todrought, drought management strategies; preparation of appropriate cropplans for dry land areas; mid contingent plan for aberrant weather Conditions.					
CO-4	Unit iv-	-	10	05	15	
	Tillage, tilth, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use.					
CO-5	Unit v-	03	02	-	05	
	Concept of watershed resource management, problems, approach and components.					
Total		11	26	13	50	

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to principles and practices of organic farming will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for abovetasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Visit to farm/ field
- 6. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Tillage and crop production.	Das nr	Scientific publishers.	2007
2	Agron technology for dryland farming.	Dhopte am.	Scientific publ.	2002.
3	Soil and water conservation research in india.	Dhruv narayan vv.	Icar.	2002.
4	Production and improvements of crops for drylands.	Gupta us. (ed.)	Oxford & ibh.	1995

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Cos, POs and PSOs Mapping Course Code:-Agron- 512

Course Title: - Dry land farming and watershed management

Program Specific Outcome

Course	Program Ou	itcomes								Program Sp	ecific Outcom	9		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	To
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student'	ve crop	alon	and	ement			knowledge	profitable			ities.	will
	of farming	S	aspects.	g	plant	of			of, and	decisions.				affect
	and	contribu		with	protec	agrono			need for	To				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in			uatio	econo	packag			developme	the mechanics				re
	India			n whic	mic	e and practic			nt in Agricultur	of agri				
					associ ated	es.			- C	Entreprene				
				h will	with	es.			e.	urship.				
				prov	farmin					ursnip.				
				ed to										
				deci	g enterp									
				sion	rises.									
				in	11505.									
				vari										
				ous										
				part										

				of agric ultur e										
CO1- Students will become to define dry land farming and its constraints.	3	3	3	1	3	1	1	1	3	3	1	2	3	1
students will become to differentiate dry land farming and rainfed farming.	3	3	3	1	3	1	1	1	3	3	1	3	2	1
constant command area.	3	2	3	1	2	3	1	1	3	3	2	2	1	2
cO4- students of pg able to evaluate concept of	3	2	1	1	1	3	1	1	1	3	1	3	2	1

conservation of tillage.														
CO5	3	1	2	1	1	3	1	1	1	2	3	1	1	1
Students will														
become as														
expert to														
design water														
harvesting														
tank under														
the														
watershed														
management														
technology.														

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Dry land farming and watershed management

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1- Students will	SO1.1		Unit-1. Definition, concept and	As mentioned in page
7,8,9	become to define	SO1.2		characteristics of dryland	number
PSO 1,2, 3, 4, 5	dry land farming			farming;dryland versus rainfed farming;	
	and its constraints.			significance and dimensions of dry land	
				farming in indian agriculture	
70.100.15.6		2011		1.1, 1.2,1.3,1.4,1.5,1.6,	
PO 1,2,3,4,5,6	CO2- students will	SO1.1		Unit-2 Soil and climatic parameters	As mentioned in page
7,8,9	become to	SO1.2		with special emphasis on rainfall	number
	differentiate dry			characteristics; constraints limiting	
PSO 1,2, 3, 4, 5	land farming and			crop production in dry land areas;	
	rainfed farming.			types of drought, characterization of	
				environment for water availability;	
				crop planning for erratic and aberrant	
				weather conditions.	
				1.1, 1.2,1.3,1.4,1.5,1.6	
PO 1,2,3,4,5,6	CO3- Pg students	SO1.1		Unit-3 Stress physiology and resistance	As mentioned in page
7,8,9	acquainting	SO1.2		to drought, adaptation of crop plants to	number
	knowledge to			drought, drought management	
PSO 1,2, 3, 4, 5	calculate catchment			strategies; preparation of appropriate	
	and command area.			crop plans for dry land areas; mid	
				contingent plan for aberrant weather	
				Conditions	
				1.1, 1.2,1.3,1.4,1.5,1.6	
PO 1,2,3,4,5,6	CO4- students of	SO1.1		Unit-4 Tillage, tilth, frequency and	
7,8,9	pg able to evaluate	SO1.2		depth of cultivation, compaction in soil	
	concept of			tillage; concept of conservation tillage;	
PSO 1,2, 3, 4, 5	conservation of			tillage in relation to weed control and	
	tillage.			moisture conservation; techniques and	

			practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6
PO 1,2,3,4,5,6	CO5 Students	SO1.1	Unit-5 Concept of watershed resource
7,8,9	will become as	SO1.2	management, problems, approach and
	expert to design		components.
PSO 1,2, 3, 4, 5	water harvesting		1.1, 1.2,1.3,1.4,1.5,1.6
	tank under the		
	watershed		
	management		
	technology.		



AKS

Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc.(Ag) Agronomy Program

Course Code: APP 501

Course Title: Principles of plant physiology

Pre-requisite: Student should have knowledge of plant physiology Core concepts in plant

physiology, with specific focus on photosynthesis, respiration, water relations, mineral nutrition, growth and allocation, hormones, secondary metabolites,

University

reproduction, and stress physiology.

Rationale: The students should be acquainted with the knowledge of Plant physiology it is a disc

botany concerned with physiological processes and activities of plants. It's a descript of variation and structure at the molecular and cellular level that leads to investigation ecological, physiological, and biochemistry-related elements of plants. Plant physiological study of all of a plant's internal functions, including the chemical and physical mecha are connected with life in plants. This encompasses research at many scales of size ar Photosynthesis, molecular interactions and internal diffusion of water, minerals, and are at the molecular level. Plant development, seasonality, dormancy, and reproductive are all activities that take place on a large scale. Phytochemistry and phytopathology major subfields of plant physiology. Plant physiology is the initial line of defence and

primary means of interaction with the environment and climate.

Course Outcomes:

App 501.1PG students will familiar with the knowledge of plant physiology.

App 501.2Students will able to acquaints knowledge about anti transparent to check the loss of water.

App 501.3Students will become expert to calculate the daily plant growth by recording the growth data taken by auxanometer.

App 501.4Students will able to acquaint knowledge to distinguish between osmosis and diffusion process.

App 501.5PG students will become expert in soil plant water relationship.

Scheme of Studies:

cinc of Stu	uics.							
Board of	Course	Course Title		Scheme of studies (Hours/Week)				Total
Study	Code		Cl	LI	SW	SL	Total Study	Credits
							Hours(CI+LI+S W+SL)	(C)
Progra	APP-	Principles of plant	3	1	1	1	6	3
m Core	501	physiology						
(SDGs								

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to

ensure outcome of Learning.

Scheme of Assessment:

Theory

						Schemo	e of Assessmer	nt (Marks)		
]	Progress	sive Asse	essment (PRA))	End Semest	Total Mark
Board of Study	Cous e Code	Course Title	Class/ Home Assig nment 5 numb	Class Test 2 (2 best out of 3)	Semi nar one	Class Activ ity any one	Class Attendance	Total Marks	er Assess ment	S
			er 3 marks each (CA)	10 marks each (CT)	(SA)	(CAT	(AT)	(CA+CT+SA+C AT+AT)	(ESA)	(PRA + ESA)
Program Core (SDGs)	APP- 501	Principles of plant physiolog y	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

App 501.1 PG students will familiar with the knowledge of plant physiology.

Approximate mours							
Item	Appx Hrs.						
Cl	6						
LI	4						
SW	1						
SL	2						
Total	13						

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOS)		(CI)	_
Session Outcomes (SOs) SO1.1Understand the Water and its importance, molecular structure of water SO1.2Understand the Concept of water potential. SO1.3 Understand the concept of osmosis and diffusion. SO1.4 Understand the Soil physical properties and water availability in different soils. SO1.5 Understand the WHC and PWP	Laboratory Instruction (LI) 1. Standard solutions and preparation of different forms of solutions 2. Studies on the basic properties of water	Unit 1: soil and plant water relations Water and its importance; molecular structure of water; properties and functions of water. Concept of water potential; plant cell and soil water potential and their components; methods to	Self-Learning (SL) 1. methods to determine cell and soil water potential 2. Studies on WHC, FC and PWP.
		 1.2 Molecular structure of water; properties and functions of water. 1.3Introduction to concept of water potential. 1.4Explain theconcept of osmosis and diffusion. 1.5 Explain the soil physical properties and water availability in different soils. 1.6 Explain the WHC, FC and PWP 	

SW-1 Suggested Sessional Work (SW): Assignments:

What is the concept of water potential? **OtherActivities(Specify):**

Research on study soil WHC, FC and PWP.

App 501.2 students will able to acquaints knowledge about anti transparent to check the loss of water.

Approximate Hours

Item	AppxHrs.
Cl	5
LI	6
SW	1
SL	1
Total	13

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Understand the Root structure	1.Demonstrati	Unit 2: water absorption and	1.Concept of root
and functions.	on of surface	translocation	structure and
	tension of	Root structure and functions; root	function of plant.
SO1.2Understand the root	water and	architecture and relevance in water	
architecture and relevance in water	other solvents.	mining; mechanism of water absorption	
mining.		and translocation; theories explaining	
	2.Measuremen	water absorption and trans	
SO1.3 Understand the mechanism of	1	location; aquaporins. Mycorrhizal	
water absorption and translocation.	water status:	association and its relevance in water	
	relative water	mining.	
SO1.4. Understand the mycorrhizal	content and		
association and its relevance in water	rate of water		
mining.	loss.	1.1 Introduction to Root structure and	
		functions.	
	3.Determinatio		
	n of water	1.2 Introduction toroot architecture and	
	potential	relevance in water mining.	
	through tissue		
	volume and	1.3 .Introduction tomechanism of water	
	chardakov's	absorption and translocation.	
	test	1 4Francia thathaning analoining sector	
		1.4 Explain thetheories explaining water	
		absorption and translocation.	
		1.5 Introduction to accompanies	
		1.5 Introduction to aquaporins.	
		Mycorrhizal association and its	
		relevance in water mining.	

SW-1 Suggested Sessional Work (SW):

Assignments:

Concept in Root structure and functions; root architecture and relevance in water mining; mechanism of water absorption and translocation; theories explaining water absorption and translocation.

Other Activities (Specify):

Research on study Mycorrhizal association and its relevance in water mining.

App 501.3students will become expert to calculate the daily plant growth by recording the growth data taken by auxanometer.

Item	Appx Hrs.
Cl	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes	Laboratory	Classroom Instruction	Self-	
(SOs)	Instruction	(CI)	Learning	
	(LI)		(SL)	
SO1.1 Understand the Evaporation and	1.Determination	Unit 3: transpiration and	1. Study	on
transpiration.	of water potential	evaporative cooling	Evaporation	and
CO12 Understand the concept of	using pressure	Evaporation and transpiration;	transpiration	in
SO1.2 Understand the concept of CCATD and its relevance.	bomb,	relevance of transpiration; factors	details.	
CCATD and its relevance.	osmometer, psychrometer	regulating transpiration; measurement of transpiration;		
SO1.3 Understand the Energy balance:	psychronieter	approaches to minimize		
solar energy input and output at crop	2.Determination	evaporation and transpiration;		
canopy level.	of soil moisture	concept of CCATD and its		
	content and soil	relevance. Energy balance: solar		
SO1.4. Understand the Stomata- its	water potential	energy input and output at crop		
structure, functions and distribution;	1	canopy level. Stomata- its		
molecular mechanisms of stomatal		structure, functions and		
opening and closing		distribution; molecular		
		mechanisms of stomata opening		
SO1.5 Understand the concept of		and closing; concept of		
Guard cell turgidity; role of k and other		Guard cell turgidity; role of k and		
osmolytes; role of aba in stomatal		other osmolytes; role of aba in		
closure; guard cells response to		stomatal closure; guard cells		
environmental signals; signaling		response to environmental signals;		
cascade associated with stomatal		signaling cascade associated with		
opening and closure.		stomatal opening and closure. Anti		
SO1.6Understand the concept of		transparent and their relevance in agriculture.		
Anti transparent and their relevance in		1.1 Introduction to Evaporation		
agriculture.		and transpiration.		
		1.2 Introduction to concept of		
		CCATD and its relevance.		
		1.3 .Introduction toEnergy balance:		
		solar energy input and output at		
		crop canopy level.		
		1.4 . Introduction toStomata- its		
		structure, functions and		
		distribution; molecular		
		mechanisms of stomatal opening		
		and closing1.5. Introduction totheconcept of		
		Guard cell turgidity; role of k and		
		other osmolytes; role of aba in		
		stomatal closure; guard cells		
	response to environmental signals			
		signaling cascade associated with		
		stomatal opening and closure.		
		1.6 .Introduction toconcept of		
		Anti transpirant sand their		

	relevance in agriculture.	
	-	

Assignments:

Role of Antitranspirants and their relevance in agriculture.

a. Other Activities(Specify):

New Research on role of physiology in agriculture.

App 501.4 students will able to acquaint knowledge to distinguish between osmosis and diffusion process.

Item	AppxHrs.
Cl	5
LI	6
SW	1
SL	1
Total	13

Session Outcomes	Laboratory	Classroom Instruction	Self-Learning		
(SOs)	Instruction	(CI)	(SL)		
	(LI)				
SO1.1 Understand the WUE and its relevance in water productivity. SO1.2Understand the transpiration efficiency, a measure of intrinsic WUE. SO1.3 Understand the approaches to measure WUE. SO1.4. Understand the stomatal and mesophyll regulation on WUE. SO1.5Understand the passioura's yield model emphasizing WUE.	1. Use of soil moisture probes and soil moisture sensors 2. Measurement of transpiration rate in plants; use of porometry. 3. Measurement of CCATD and its relevance.	Unit 4: water productivity and water use efficiency WUE and its relevance in water productivity; transpiration efficiency, a measure of intrinsic WUE; approaches to measure WUE; stomatal and mesophyll regulation on WUE; passioura's yield model emphasizing WUE. 1.1Introduction to WUE and its relevance in water productivity. 1.2.Introduction tothe transpiration efficiency, a measure of intrinsic WUE. 1.3.Introduction tothe approaches to measure WUE. 1.4 Introduction the stomatal and mesophyll regulation on WUE. 1.5Introduction topassioura's yield model emphasizing WUE.	1. Study on different crop.	WUE	of

Assignments:

Crop diversification for sustainability; role of WUE in maintenance of soil Moisture.

Other Activities(Specify):

Research on WUE.

App 501.5PG students will become expert in soil plant water relationship.

Item	AppxHrs.
Cl	6
LI	6
SW	1
SL	1
Total	14

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Understand the Physiology of	1.	Unit 5: moisture stress and	1.Study on
water stress in plants.	Demonstration	plant growth	Physiology of water
•	and use of	Physiology of water stress in	stress in plants.
SO1.2 Understand the effect of	anti-	plants; effect of moisture stress at	
moisture stress.	transpirants to	molecular, cellular organ and	
	reduce	plant level. Drought indices and	
SO1.3 Understand the cellular organ	transpiration.	drought tolerance strategies.	
and plant level.		Drought tolerance traits.	
	2. Influence of		
SO1.4 . Understand the Drought	potassium and	1.1 Introduction the Physiology of	
indices.	aba on	water stress in plants.	
	stomatal	1011 1 2 1 11 1 1	
SO1.5. Understand the Drought	opening and	1.2.1 Introduction to Understand	
tolerance.	closing respectively	the effect of moisture stress.	
CO16 Understand the Ducusht	respectively	1.3 .Introduction to the cellular	
SO1.6 . Understand the Drought tolerance traits.	3.Deficiency	organ and plant level.	
tolerance traits.	and toxicity	organ and plant level.	
	symptoms of	1.4. Introduction to the Drought	
	nutrients	indices.	
		1.5 .Introduction to the Drought	
		tolerance.	
		1.6 Introduction to the Drought	
		tolerance traits.	

Assignments:

Understand the Physiology of water stress in plants.

b. Other Activities(Specify):

Study on Drought tolerance traits.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lectu re (Cl)	Laborator y Instruction (LI)	Sessional Work (SW)	Self Learning (SL)	Total hour (Cl+LI+S W+Sl)
App 501.1 pg students will familiar with the knowledge of plant physiology.	6	4	1	2	13
App 501.2 students will able to acquaints knowledge about antitranspirant to check the loss of water.		6	1	1	13
App 501.3students will become expert to calculate the daily plant growth by recording the growth data taken by auxanometer.		4	1	1	12
App 501.4 students will able to acquaint knowledge to distinguish between osmosis and diffusion process.		6	1	1	13
App 501.5 PG students will become expert in soil plant water relationship.	6	6	1	1	14
Total Hours	28	26	5	6	65

Suggestion for End Semester Assessment

CO	Unit Titles		Marks Distrib		Total Marks
		R	U	A	
CO-1	Unit 1: soil and plant water relations Water and its importance; molecular structure of water; properties and functions of water. Concept of water potential; plant cell and soil water potential and their components; methods to determine cell and soil water potential; concept of osmosis and diffusion. Soil physical properties and water availability in different soils; water holding capacity and approaches to improve WHC; concept of FC and PWP; Water holding polymers and their relevance.	03	01	01	05
CO-2	Unit 2: water absorption and translocation Root structure and functions; root architecture and relevance in water mining; mechanism of water absorption and translocation; theories explaining water absorption and translocation; aquaporins. Mycorrhizal association and its relevance in water mining.	02	06	02	10
CO-3	Unit 3: transpiration and evaporative cooling Evaporation and transpiration; relevance of transpiration; factors regulating transpiration; measurement of transpiration; approaches to minimize evaporation and transpiration; concept of CCATD and its relevance. Energy balance: solar energy input and output at crop canopy level. Stomata- its structure, functions and distribution; molecular mechanisms of stomatal opening and closing; concept of Guard cell turgidity; role of k and other osmolytes; role of aba in stomatal closure; guard cells response to environmental signals; signaling cascade associated with stomatal opening and closure. Antitranspirants and their relevance in agriculture.	03	07	05	15
CO-4	Unit 4: water productivity and water use efficiency WUE and its relevance in water productivity; transpiration efficiency, a measure of intrinsic WUE; approaches to measure WUE; stomatal and mesophyll regulation on WUE; passioura's yield model emphasizing WUE.	-	10	05	15

	Unit 5: moisture stress and plant growth	03	02	-	05
CO-5	Physiology of water stress in plants; effect of moisture stress at molecular, cellular organ and plant level. Drought indices and drought tolerance strategies. Drought tolerance traits.				
	Total	11	26	13	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Principles and practices of soil fertility and nutrients management will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Visitto field
- 7. Demonstration
- 8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Plant Physiology	Bhatia KN & Prashar AN.	Truman Book Company.	1990
2	Plant Physiology	Salisbury FB. & Ross CW	Wordsworth Publishing Company.	1992
3	Plant Physiology	F. B. and Ross, C. W.	Thomson Asia Ptd, Ltd. Singapore.	2004
4	Physicochemical and Environmental Plant Physiology.	Nobel P. S.	Elsevier Academic Press, Amsterdam Salisbury,	2005
5	Physiological Plant Ecology: Ecophysiology and Stress Physiology of Functional Groups	Larcher, W.	Springer Science & Business Media	2003

Curriculum Development Team

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Cos, POs and PSOs Mapping Course Code:- APP 501

Course Title: - Principles of plant physiology

Course	Program O	utcomes								Program S	pecific Outco	me		
Outcomes	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific knowledg e of various branches of agronomy will be made specialize d and to provide knowledg e dissemina tion regarding various technique of farming and farming system in India	Wide knowle dge in the concer ning subject which will improve the farmer's condition through student's contributions.	Detailed knowle dge regardin g package and practice s soil fertilize r and water manage ment of producti ve crop aspects.	Use appr opri ate scie ntifi c met hod s coll abor atio n with stati stics alon g with eval uati on whi ch	Detai led know ledge of cultiv ation practi ces, soil, fertili zers, water mana geme nt and plant prote ction econo mic assoc iated with	Create , select and apply an approp riate techni ques, resour ces and moder n it tools in impro vemen t of agrono mical packa ge and practic	Studen t will apply various statisti cal method s to analyz e their master researc h work	Student will apply basic concepts in laboratory technique s during their research work	Understa nd the impact of the professio nal expert solutions in societal and environm ental contexts, and demonstr ate the knowledg e of, and need for sustainab le developm ent in Agricultu re.	Enable to recognize and examine the relationsh ips between inputs and outputs in their agricultur al field to make effective and profitable decisions. To understan d the mechanic s of agri Entrepren eurship.	Acquaintin g with basic concepts theories and terminolog y of Agronomy.	To undertake teaching research and extension activates along with administrat ive and consultanc y services.	Apply resear ch and experti se in resolvi ng the proble ms of existin g farm in the periph ery of univer sities.	To underst and and analyze the current issues that are occurring in local and global agricult ure and how they will affect futuristic agricult ure

				will pro ved to deci sion in vari ous part of agri cult ure	farmi ng enter prises	es.								
CO1- pg students will familiar with the knowledge of plant physiology.	3	3	3	3	3	1	1	1	3	3	1	2	3	1
CO2-students will able to acquaints knowledge about antitranspirant to check the loss of water.	3	3	3	2	3	1	1	1	3	3	1	3	2	1
CO3students will become expert to calculate the daily plant	3	2	1	3	2	3	1	1	3	3	2	2	1	2

growth by recording the growth data taken by auxanometer.														
CO 4 students will able to acquaint knowledge to distinguish between osmosis and diffusion process.	3	2	1	3	1	3	1	1	1	3	1	3	2	1
cos-PG students will become expert in soil plant water relationship.	3	1	2	3	1	3	1	1	1	2	3	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Principles of plant physiology

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- pg students will familiar with the knowledge of plant physiology.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1. Water and its importance; molecular structure of water; properties and functions of water. Concept of water potential; plant cell and soil water potential and their components; methods to determine cell and soil water potential; concept of osmosis and diffusion. Soil physical properties and water availability in different soils; water holding capacity and approaches to improve WHC; concept of FC and PWP; Water holding polymers and their relevance.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2-students will able to acquaints knowledge about antitranspirant to check the loss of water.	SO1.1 SO1.2 SO1.3 SO1.4		1.1, 1.2,1.3,1.4,1.5,1.6. Unit-2 Root structure and functions; root architecture and relevance in water mining; mechanism of water absorption and translocation; theories explaining water absorption and trans location; aquaporins. Mycorrhizal association and its relevance in water mining. 1.1, 1.2,1.3,1.4,1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3students will become expert to calculate the daily plant growth by recording the growth data taken by auxanometer.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		Unit-3 Evaporation and transpiration; relevance of transpiration; factors regulating transpiration; measurement of transpiration; approaches to minimize evaporation and transpiration; concept of CCATD and its relevance. Energy balance: solar energy input and output at crop canopy level. Stomata- its structure, functions and distribution; molecular mechanisms of stomata opening	1 0

			and closing; concept of Guard cell turgidity; role of k and other osmolytes; role of aba in stomatal closure; guard cells response to environmental signals; signaling cascade associated with stomatal opening and closure. Anti transparent and their relevance in agriculture. 1.1, 1.2,1.3,1.4,1.5,1.6
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 students will able to acquaint knowledge to distinguish between osmosis and diffusion process.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit 4. WUE and its relevance in water productivity; transpiration efficiency, a measure of intrinsic WUE; approaches to measure WUE; stomatal and mesophyll regulation on WUE; passioura's yield model emphasizing WUE 1.1, 1.2,1.3,1.4 1.5
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5-PG students will become expert in soil plant water relationship.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6	Unit 5 Physiology of water stress in plants; effect of moisture stress at molecular, cellular organ and plant level. Drought indices and drought tolerance strategies. Drought tolerance traits. 1.1, 1.2,1.3,1.4 1.5,1.6



A K S University Faculty of Agricultural Science and Technology Curriculum of M.Sc. (All Branches)

Course Code: STAT 512

Course Title: Experimental Designs

Pre-requisite: Experimental design is the process of carrying out research in an objective

and controlled fashion so that precision is maximized and specific conclusions can be drawn regarding a hypothesis statement. Generally, the purpose is to establish the effect that a factor or independent variable has

on a dependent variable.

Rationale: Experimental design is used to establish the effect an independent variable

has on a dependent variable. An experimental design helps a researcher to objectively analyze the relationship between variables, thus increasing the

accuracy of the result.

Course Outcomes: CO1 Understand of basic concepts of design of experiments. Introduction

to planning valid and economical experiments within given resources.

CO2 Analyze completely randomized design, Randomized block design, Latin square design. The conditions and circumstances under which results

of the experiment are valid should be extensive.

CO3 Understand and compute Full and confounded factorial designs with

two and three levels. Fractional factorial designs with two levels.

CO4 Understand the purpose for balanced incomplete block design, resolvable designs and their applications. Split and Strip plot design will help students to know the applications of DOE and learn and apply these

techniques in the field experiment.

Scheme of Studies:

Board of	Course	Course Title	Scheme of stu		e of stud	ies(Hours/Week)	Total	
Study	Code		Cl	LI	SW	SL	Total Study	Credits
							Hours	(C)
							(CI+LI+SW+SL)	1
Program	STAT 512	EXPERIMENTAL	2	01	02	01	6	3
Core		DESIGNS						1
(PCC)								

Legend: CI:Class room Instruction (Includes different instructional strategies i.e. Lecture (L)

and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory

workshop, field or other locations using different instructional strategies) **SW:**Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and

feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

			Marks)	Scheme	e of Assessn	nent (
			,	e Assessm	ent (PRA))		End Semester Assessmen	Total Mar ks
Board of Study	Course Code	Course Title	Class/Home Assignment 1 number 5 marks each	Class Test 2 (2 best out) 15 marks	Practical Exam	Class Attenda nce	Total Marks	t	
			(CA)	each (CT)	(PA)	(AT)	(CA+CT +PA+AT	(ESA)	(PRA+ ESA)
PCC	STAT 512	ED	5	30	10	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

STAT 512 CO-1 Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources

Approximate Hours

* *	
Item	Appx. Hrs.
CI	3
LI	4
SW	1
SL	2
Total	10

Session Out Comes (SOs)	Laboratory Instruction	Classroom Instruction	Self- Learning
(508)	(LI)	(CI)	(SL)
so1.1 Design of Experiment is a tool to develop an experimentation strategy that maximizes learning using a minimum of resources. SO1.2 Extensively used by engineers and scientists involved in the improvement of manufacturing processes to maximize yield and decrease variability. SO1.3 It is widely used in many fields with broad application across all the natural and social sciences, to name a few: Biostatistics, Agriculture, Marketing, Software engineering, Industry etc.	1-Uniformity trial data analysis. 2- formation of plots and blocks, Fairfield Smith Law	Unit-1. Need for designing of experiments, characteristics of a good design. Basic principles of designs-randomization, replication and local control. 1.1. Need for designing of experiments 1.2 characteristics of a good design 1.3 Basic principles of designs-randomization, replication and local control	1. Prepare the assignment on Basic principles of designs-randomization, replication and local control.

SW-1 Suggested Sessional Work (SW):

- **a. Assignments:** Prepare the assignment on Basic principles of designs- randomization, replication and local control.
- b. Mini Project: -
- c. Other Activities (Specify):-

STAT 512 CO-2 Analyze completely randomized design, Randomized block design, Latin square design. The conditions and circumstances under which results of the experiment are valid should be extensive.

Approximate Hours

Item	Appx. Hrs.
CI	5
LI	6
SW	1
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
so2.1 Good experimental design is important in all research, it helps to ensure the data collection, data analysis and conclusions from a study, are valid (true). so2.2 Experiments are designed to test hypotheses, or specific statements about the relationship between variables.	1- Analysis of data obtained from CRD 2 Analysis of data obtained from RBD 3 Analysis of data obtained from LSD	 Unit-2 Uniformity trials, size and shape of plots and blocks; Analysis of variance; Completely randomized design, randomized block design and Latin square design. 1.1 Uniformity trials 1.2 size and shape of plots and blocks 1.3. Analysis of variance; Completely randomized design 1.4 Analysis of variance; randomized block design 1.5 Analysis of variance; Latin square design. 	1. Prepare the assignment on Analysis of variance; Completely randomized design, randomized block design and Latin square design.

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Simple Problems Based on Analysis of variance; Completely randomized design, randomized block design and Latin square design.

a. Other Activities (Specify):

STAT 512 CO-3 Understand and compute Full and confounded factorial designs with two and three levels. Fractional factorial designs with two levels.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	14
SW	1
SL	2
Total	23

Session Out Comes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
so3.1 Experimental methods introduce erogeneity, allowing researchers to draw conclusions about the effects of an event or a program. so3.2 An experimental design helps a researcher to objectively analyze the relationship between variables, thus increasing the accuracy of the result.	1- Analysis of factorial experiments without confounding. 2- Analysis of factorial experiments with confounding. 3- Analysis with missing data in CRD. 4- Analysis	Unit-3 Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom, Confounding in symmetrical factorial experiments, Factorial experiments with control treatment. 1.1. Factorial experiments, (symmetrical) 1.2 Factorial experiments, (asymmetrical) 1.3 orthogonality	1. Prepare the assignment on Factorial experiments with control treatment.
	with missing data in RBD. 5- Analysis with missing data in LSD. 6- Split plot designs. 7- Strip plot designs	 1.4 partitioning of degrees of freedom 1.5. Confounding in symmetrical factorial experiments 1.6. Factorial experiments with control 	

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Factorial experiments with control treatment. **Other Activities (Specify):**

STAT 512 CO-4 Understand the purpose for balanced incomplete block design, resolvable designs and their applications. Split and Strip plot design will help students to know the applications of DOE and learn and apply these techniques in the field experiment.

Item	Appx Hrs.
CI	16
LI	6
SW	1
SL	2
Total	25

Session Out Comes	Laboratory	Classroom Instruction (CI)	Self-Learning
(SOs)	Instruction		(SL)
SO4.2 Make sure your experiment is adequately	1- Transformation of data. 2- Analysis of resolvable designs 3- Fitting of response surfaces.	Unit-4 Split plot and strip plot designs; Analysis of covariance and missing plot techniques in randomized block and Latin square designs; Transformations, crossover designs, balanced incomplete block design, resolvable designs and their applications ~ Lattice design, alpha design-concepts, randomization procedure, analysis and interpretation of results. Response surfaces. Experiments with mixtures. 1.1 Split plot 1.2 strip plot designs 1.3 Analysis of covariance 1.4 Missing plot techniques in randomized block. 1.5 Missing plot techniques in Latin square designs. 1.6 Transformations 1.7 crossover designs 1.8 balanced incomplete block design 1.9 resolvable designs 1.10 Applications of resolvable designs Lattice design 1.11 Lattice design 1.12 Applications of	1. Prepare the assignment on Analysis of covariance and missing plot techniques in randomized block and Latin square designs

Lattice design	
1.13 Alpha design-concepts.	
1.14 Randomization	
procedure.	
1.15 Interpretation of	
results.	
1.16 Response surfaces.	
Experiments with mixtures	

Assignments: Prepare the assignment on Analysis of covariance and missing plot techniques in randomized block and Latin square designs

Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C l)	Laborato ry Lecture (L I)	Sessional Work (SW)	Self Learning (S l)	Total hour (C l + LI+ SW +S l)
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources.	03	04	01	02	10
CO2: Analyze completely randomized design, Randomized block design, Latin square design. The conditions and circumstances under which results of the experiment are valid should be extensive.	05	06	01	02	14
CO3: Understand and compute Full and confounded factorial designs with two and three levels. Fractional factorial designs with two levels.	06	14	01	02	25
CO4: Understand the purpose for balanced incomplete block design, resolvable designs and their applications. Split and Strip plot design will help students to know the applications of DOE and learn and apply these techniques in the field experiment.	16	06	01	02	25

Total Hours	30	30	04	08	74

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit title	N	Iarks Distrib	ution	Total
		R	U	A	Marks
CO-1	Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources.	04	04	04	12
CO-2	Analyze completely randomized design, Randomized block design, Latin square design. The conditions and circumstances under which results of the experiment are valid should be extensive	04	04	04	12
CO-3	Understand and compute Full and confounded factorial designs with two and three levels. Fractional factorial designs with two levels.		04	04	12
CO-4	Understand the purpose for balanced incomplete block design, resolvable designs and their applications. Split and Strip plot design will help students to know the	05	04	05	14

applications of DOE and learn and apply these techniques in the field experiment.				
Total	17	16	17	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Experimental Designs will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Demonstration
- 7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 8. Brainstorming

Suggested Learning Resources:

S.	Title	Author	Publisher	Edition &
No.				Year
01	Basic Concepts and	Felix Kusanedzie	Science PG	
	Application of	Sylverster Achio		
	Experimental	Edmund Ameko		
	Designs and			
	Analysis			
02	Theory and Analysis	B.L. Agrawal	CBS	
	of Experimental			
	Designs			
03	Design and Analysis	Angela Dean		
	of Experiments	Daniel Voss	Springer	

Curriculum Development Team:

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Cos, POs and PSOs Mapping Course Code:- STAT 512

Course Title: - Experimental Designs

Course	Program (Outcome	S							Program S	Specific Out	come		
Outcomes	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detaile	Use	Detai	Create	Studen	Student	Understa	Enable to	Acquainti	То	Apply	То
	knowledg e of	knowl edge	d knowle	app ropr	led know	, select	t will apply	will apply	nd the impact	recogniz e and	ng with basic	undertake teaching	resear ch	underst and
	various	in the	dge	iate	ledge	and	variou	basic	of the	examine	concepts	research	and	and
	branches	concer	regardi	scie	of	apply	S	concepts	professio	the	theories	and	expert	analyze
	of agronom	ning subjec	ng packag	ntifi c	cultiv ation	an appro	statisti cal	in laborator	nal expert	relations hips	and terminolo	extension activates	ise in resolv	the current
	y will be	t	e and	met	practi	priate	metho	y	solutions	between	gy of	along	ing	issues
	made specialize	which will	practice s soil	hod s	ces, soil,	techni ques,	ds to analyz	technique s during	in societal	inputs and	Agronom y.	with administra	the proble	that are occurri
	d and to	impro	fertilize	coll	fertili	resour	e their	their	and .	outputs		tive and	ms of	ng in
	provide knowledg	ve the farmer	r and water	abo rati	zers, water	ces and	master resear	research work	environ mental	in their agricultu		consultan cy	existi ng	local and
	e	S	manage	on	mana	moder	ch		contexts,	ral field		services.	farm	global
	dissemin ation	conditi on	ment of product	wit h	geme nt	n it tools	work		and demonst	to make effective			in the periph	agricult ure and
	regarding	throug	ive	stati	and	in			rate the	and			ery of	how
	various	h	crop	stic	plant	impro			knowled	profitabl			univer	they
	technique of	studen t's	aspects.	s alo	prote ction	veme nt of			ge of, and need	e decisions			sities.	will affect
	farming	contri		ng	econ	agron			for	. To				futurist
	and	bution		wit	omic	omica			sustaina ble	understa nd the				ic
	farming system in	S.		h eval	assoc iated	packa			develop	mechanic				agricult ure
	India			uati	with	ge			ment in	s of agri				-
				on	farmi	and			Agricult	Entrepre				

				whi ch will pro ved to deci sion in vari ous part of agri cult ure	ng enter prise s.	practi ces.			ure.	neurship.				
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources.	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO2: Analyze completely	1	2	1	3	1	3	3	3	3	3	1	2	3	3

randomized design, Randomized block design, Latin square design. The conditions and circumstance s under which results of the experiment are valid should be extensive.														
CO3: Understand and compute Full and confounded factorial designs with two and three levels. Fractional factorial designs with two levels.	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO4: Understand the purpose for balanced	1	2	1	3	1	3	3	3	3	3	1	2	3	3

incomplete							
block design,							
resolvable							
designs and							
their							
applications.							
Split and							
Strip plot							
design will							
help students							
to know the							
applications							
of DOE and							
learn and							
apply these							
techniques in							
the field							
experiment.							

Course Curriculum Map: Experimental Designs

Ī	POs & PSOs	COs No.&	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning
	No.	Titles		Instruction(LI)		(SL)
	PO 1,2,3,4,5,6	CO1:	SO1.1		Unit-1. Need for designing of experiments, characteristics	As mentioned
	7,8,9	Understand of	SO1.2		of a good design. Basic principles of designs-	in page
	PSO 1,2, 3, 4,	basic concepts	SO1.3		randomization, replication and local control.	number
	_ ~,_, _, .,	of design of			1.1, 1.2,1.3.	

PO 1,2,3,4,5,6 7,8,9	experiments. Introduction to planning valid and economical experiments within given resources. CO2: Analyze completely	SO2.1 SO2.2	Unit-2 2 Uniformity trials, size and shape of plots and blocks; Analysis of variance; Completely randomized	As mentioned in page
PSO 1,2, 3, 4, 5	randomized design, Randomized block design, Latin square design. The conditions and circumstances under which results of the experiment are valid should be extensive.	302.2	design, randomized block design and Latin square design. 1.1, 1.2,1.3,1.4,1.5.	number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4,	CO3: Understand and compute Full and confounded factorial designs with two and three levels. Fractional factorial designs with two levels.	SO3.1 SO3.2	Unit-3. Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom, Confounding in symmetrical factorial experiments, Factorial experiments with control treatment. 1.1, 1.2,1.3,1.4,1.5,1.6	As mentioned in page number

PO 1,2,3,4,5,6	CO4:	SO4.1	Unit 4 Split plot and strip plot designs; Analysis of	As mentioned
7,8,9	Understand the	SO4.2	covariance and missing plot techniques in randomized	in page
PSO 1,2, 3, 4,	purpose for	SO4.3	block and Latin square designs; Transformations,	number
5	balanced		crossover designs, balanced incomplete block design,	
	incomplete		resolvable designs and their applications ~ Lattice design,	
	block design,		alpha design-concepts, randomization procedure, analysis	
	resolvable		and interpretation of results. Response surfaces.	
	designs and		Experiments with mixtures.	
	their		1.1, 1.2,1.3,1.4	
	applications.		1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13,1.14,1.15,1.16,1.17.	
	Split and Strip			
	plot design will			
	help students to			
	know the			
	applications of			
	DOE and learn			
	and apply these			
	techniques in			
	the field			
	experiment.			



A K S University

Faculty of Agricultural Science and Technology Department of Agronomy Curriculum of M.Sc. (All Branches)

Course Code: PGS 503

Course Title: Intellectual Property and Its Management in Agriculture

Pre- requisite: To teach the physiology of Intellectual Property and Its Management in

Agriculture

Rationale: The main objective of this course is to equip students and stakeholders

with knowledge of Intellectual Property Rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value

creation in a knowledge based economy.

Course outcomes:

PGS 503.1: Students will be able to understand Historical perspectives and need for the introduction of Intellectual Property Right.

PGS 503.2: Students will be able to understand National Biodiversity protection initiatives. Convention on Biological Diversity.

PGS 503.3: Students will be able to understand Research Collaboration Agreement, License agreement

Scheme of Studies:

Board of Study	Course				Scheme of studies (Hours/Week)			Total Credits(C)
	Code	Course Title	Cl	LI	SW	SL	Total Study Hours(CI+LI+ SW+SL)	
Program Core (PGS)	PGS 503	Intellectual Property and Its Management in Agriculture		0	1	1	3	1

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and

feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Theory									
Board of	Course Code	Course			Progressive .ssessment(RA)			End Semester Assessmen t	Total Mar ks
Study		Title	Class/Home Assignment 1number 5 marks each	20 marks	Practical	Class Attenda nce	Total Marks		PRA+
			(CA)		(PA)	(AT)	(CA+CT+P A+AT)	(ESA)	ESA)
PGS	PGS 503	Intellectu al Property and Its Manage ment in Agricultu re	5	40	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes(SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

PGS 503.1: Students will be able to understand Historical perspectives and need for the introduction of Intellectual Property Right.

Approximate Hours

Item	AppX Hrs
Cl	04
LI	0
SW	01
SL	02
Total	07

Session Outcomes(SOs)	Laboratory	Classroom Instruction(CI)	Self-Learning		
	Instruction(LI)		(SL)		
SO1.1 Student will understand		Unit-1. Historical perspectives	1. Role	of	
the Historical perspectives and		and need for the introduction of	IPR and	its	
need for the introduction of		Intellectual Property Right regime;	benefits.		
Intellectual Property Right.		TRIPs and various provisions in			
		TRIPS Agreement; Intellectual	2. Role	of	
SO1.2 Student will recognize		Property and Intellectual Property	TRIPS and	its	
the TRIPs and various		Rights (IPR), benefits of securing	benefits		
provisions in TRIPS		IPRs.			
Agreement.					
SO1.3 Student will understand different Intellectual Property		1.1 Historical perspectives and need for the introduction of Intellectual Property Right regime.	f		
and Intellectual Property Rights (IPR), benefits of securing IPRs		1.2 TRIPs and various provisions in TRIPS Agreement.	S		
		1.3 Intellectual Property and Intellectual Property Rights (IPR).			
		1.4 Benefits of securing IPRs.			

SW-1 Suggested Sessional Work (SW): Assignments:

I. Preparation of file and write the role of IPR and TRIPS and their purpose.

PGS 503.2: Students will be able to understand National Biodiversity protection initiatives. Convention on Biological Diversity.

Approximate Hours

ripprominate riours						
Item	AppXHrs					
Cl	06					
LI	0					
SW	02					
SL	03					
Total	11					

			10000		-	
Session Outcomes(SOs)	Laboratory	Class	room Instruction	n(CI)	S	elf -
	Instruction(LI)				Learr	ning(SL)

SO2.1 Students will	Unit-2 Indian Legislations for the	1. Basic
understand the Indian	protection of various types of	Indian
Legislations for the	Intellectual Properties;	Legislature.
protection of various types	Fundamentals of patents,	
of Intellectual Properties;	copyrights, geographical	
Fundamentals of patents,	indications, designs and layout,	2. Plant
copyrights, geographical	trade secrets and traditional	varieties and
indications, designs and	knowledge, trademarks, protection	
layout	of plant varieties and farmers' rights	(2001)
	and biodiversity protection;	(2001).
	Protectable subject matters,	
SO2.2Students will	protection in biotechnology,	
understand the trade	protection of other biological	3.
secrets and traditional	T T T	Biodiversity act
knowledge, trademarks,	protection.	(2002).
protection of plant		
varieties and farmers'	2.1 Indian Legislations for the	
rights and biodiversity	protection of various types of	
protection.	Intellectual Properties.	
protection	2.2 Fundamentals of patents,	
	copyrights, geographical	
	indications, designs and layout.	
SO2.3 Students will	2.3 trade secrets and traditional	
identify the role of	knowledge and trademarks.	
Protectable subject	2.4 protection of plant varieties	
matters, protection in	and farmers' rights and	
biotechnology, protection	biodiversity protection.	
of other biological	2.5 Protectable subject matters,	
materials, ownership and	protection in biotechnology.	
period of protection.	2.6 protection of other biological	
	materials, ownership and period of	
	protection.	

SW-2 Suggested Seasonal Work (SW):

Assignments:

I. Note on Plant varieties and farmers' rights act (2001).

II. Note on Biodiversity act (2002).

PGS 503.3: Students will be able to understand Research Collaboration Agreement, License agreement Approximate Hours

Аррголипац	IIUuIS
Item	AppXHrs
Cl	05
LI	0
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Students will identify the National Biodiversity protection initiatives and Convention on Biological Diversity.		Unit-3: National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer	Plant Genetic Resources.
SO3.2 Students will understand the International Treaty on Plant Genetic Resources for Food and Agriculture and Licensing of technologies. SO3.2 Students will understand the Material transfer agreements, Research collaboration Agreement and License Agreement.		agreements, Research collaboration Agreement, License Agreement. 3.1 National Biodiversity protection initiatives. 3.2 Conventions on Biological Diversity. 3.3 International Treaty on Plant Genetic Resources for Food and Agriculture. 3.4 Licensing of technologies and Material transfer agreements. 3.5 Research collaboration Agreement and License Agreement.	

SW-3 Suggested Sessional Work (SW):

- a. **Assignments**:
- i. Note on Plant Genetic Resources.
- ii. Note on National Biodiversity protection initiatives

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Sessional	Self-	Total hour
	Lecture	Work (SW)	Learning	(Cl+SW+Sl)
	(Cl)		(Sl)	
CO1- Students will be able to	04	01	02	07
understand Historical				
perspectives and need for the				
introduction of Intellectual				
Property Right.				
CO.2: Students will be able to	06	02	03	11

understand National				
Biodiversity protection				
initiatives. Convention on				
Biological Diversity.				
CO.3 Students will be able to	05	02	01	08
understand Research				
collaboration Agreement,				
License agreement.				
Total	15	05	06	26

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	•	rks Distribu	tion	Total
		R	U	A	Marks
CO 1	Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs.	05	03	02	10
CO 2	Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection.	05	02	03	10
CO 3	National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.	05	03	02	10

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Intellectual Property and Its Management in Agriculture** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment. Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Visit to organic fields
- 7. Demonstration
- 8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming

Suggested Learning Resources:

(a) Books:

S.	Title	Author	Publisher	Edition &
No.				Year
1	Intellectual Property Rights in	Erbisch FH and	CABI.	1998
	Agricultural Biotechnology	Maredia K		
2	Intellectual Property Rights:	•Ganguli P	McGraw-Hill.	2001
	Unleashing Knowledge Economy			
3	Intellectual Property Rights: Key		NRDC and	2001
	to New Wealth Generation		Aesthetic	
			Technologies.	
4	State of Indian Farmer. Vol. V.	 Ministry of Agriculture, 	Academic	2004
	Technology Generation and IPR	Government of India	Foundation	
	Issues			
5	Intellectual Property Rights in	 Rothschild M and Scott 	CABI	2003
	Animal Breeding and Genetics	N		

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Cos, POs and PSOs Mapping Course Code:- PGS 503

Course Title: Intellectual Property and Its Management in Agriculture

Course	Program (Outcome	s							Program	Specific Out	come		
Outcomes	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detaile	Use	Detai	Create	Studen	Student	Understa	Enable to	Acquainti	То	Apply	To
	knowledg	knowl	d	app	led	,	t will	will	nd the	recogniz	ng with	undertake	resear	underst
	e of	edge	knowle	ropr	know	select	apply	apply	impact	e and	basic	teaching	ch	and
	various	in the	dge	iate	ledge	and	variou	basic	of the	examine	concepts	research	and	and
	branches	concer	regardi	scie	of	apply	S	concepts	professio	the	theories	and	expert	analyze
	of	ning	ng	ntifi	cultiv	an	statisti	in	nal	relations	and	extension	ise in	the
	agronom y will be	subjec t	packag e and	c met	ation practi	appro priate	cal metho	laborator	expert solutions	hips	terminolo	activates	resolv	current
	made	which	practice	hod	ces,	techni	ds to	y technique	in	between	gy of	along	ing	issues
	specialize	will	s soil	S	soil,	ques,	analyz	s during	societal			with	the	
	d and to	impro	fertilize	coll	fertili	resour	e their	their	and	inputs	Agronom			that are
	provide	ve the	r and	abo	zers,	ces	master	research	environ	and	y.	administra	proble	occurri
	knowledg	farmer	water	rati	water	and	resear	work	mental	outputs		tive and	ms of	ng in
	e	S	manage	on	mana	moder	ch		contexts,	in their		consultan	existi	local
	dissemin	conditi	ment of	wit	geme	n it	work		and	agricultu		cy	ng	and
	ation	on	product	h	nt	tools			demonst	ral field		services.	farm	global
	regarding	throug	ive	stati	and	in			rate the	to make			in the	agricult
	various	h	crop	stic	plant	impro			knowled	effective			periph	ure and
	technique of	studen t's	aspects.	S	prote	veme nt of			ge of,	and			ery of	how
	farming	contri		alo	ction econ				and need for	profitabl			univer	they
	and	bution		ng wit	omic	agron omica			sustaina	e			sities.	will
	farming	S.		h	assoc	1			ble	decisions				affect
	system in			eval	iated	packa			develop	. To				futurist
	India			uati	with	ge			ment in	understa				ic
				on	farmi	and			Agricult	nd the				agricult
				whi	ng	practi			ure.	mechanic				agricuit

				ch will pro ved to deci sion in vari ous part of agri cult ure	enter prise s.	ces.				s of agri Entrepre neurship.				ure
Students will be able to understand Historical perspectives and need for the introduction of Intellectual Property Right.	1	3	1	2	1	3	3	1	3	1	3	3	3	2
CO.2: Students will be able	1	3	1	2	1	3	3	1	3	1	3	3	3	2

					,									
to														
understand														
National														
Biodiversity														
protection														
initiatives.														
Convention														
on														
Biological														
Diversity.														
					1									
CO.3	1	3	1	2	1	3	3	1	3	1	3	3	3	2
CO.3 Students	1	3	1	2	1	3	3	1	3	1	3	3	3	2
	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students will be able	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students will be able to	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students will be able to understand	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students will be able to understand Research	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students will be able to understand Research collaboratio	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students will be able to understand Research collaboratio n	1	3	1	2	1	3	3	1	3	1	3	3	3	2

Course Curriculum Map: Intellectual Property and Its Management in Agriculture

POs & PSOs	COs No.&	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning
No.	Titles		Instruction(LI)		(SL)
PO 1,2,3,4,5,6	CO1-	SO1.1		Unit-1 . Historical perspectives and need for the	As mentioned in
7,8,9	Students will	SO1.2		introduction of Intellectual Property Right regime; TRIPs	page number
PSO 1,2, 3, 4,	be able to	SO1.3		and various provisions in TRIPS Agreement; Intellectual	
5	understand			Property and Intellectual Property Rights (IPR), benefits of securing IPRs.	
	Historical			1.1, 1.2,1.3,1.4	
	perspectives			1.1, 1.2,1.3,1.7	
	and need for				
	the				
	introduction				
	of Intellectual				
	Property				
	Right.				
PO 1,2,3,4,5,6	CO.2:	SO2.1		Unit-2. Indian Legislations for the protection of various	As mentioned in
7,8,9	Students will	SO2.2		types of Intellectual Properties; Fundamentals of patents,	page number
	be able to	SO2.3		copyrights, geographical indications, designs and layout,	
PSO 1,2, 3, 4,	understand			trade secrets and traditional knowledge, trademarks,	
5	National			protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters,	
	Biodiversity			protection in biotechnology, protection of other biological	
	protection			materials, ownership and period of protection.	
	initiatives.				
	Convention			1.1, 1.2,1.3,1.4,1.5,1.6.	
	on				
	Biological				
	Diversity.				
PO 1,2,3,4,5,6	CO.3	SO3.1		Unit-3. National Biodiversity protection initiatives;	As mentioned in
7,8,9	Students will	SO3.2		Convention on Biological Diversity; International Treaty	page number
				on Plant Genetic Resources for Food and Agriculture;	

PSO 1,2, 3, 4, 5	be able to understand Research collaboration	SO3.3	Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement1.1, 1.2,1.3,1.4,1.5,1.6
	Agreement, License		
	agreement.		



A K S University Faculty of Agricultural Science and Technology Department of Biochemistry and Crop Physiology Curriculum of M.Sc. (All Branches)

Course Code: PGS504

Course Title: Basic Concept in laboratory
Pre requisite: No specific requirements

Rationale: No specific requirements

Studying basic 1

Studying basic laboratory techniques are fundamental for scientific research, ensuring accurate experimentation and data analysis. Mastery of these skills cultivates precision, reproducibility, and safety, forming the cornerstone of scientific inquiry across disciplines and facilitating advancements in

knowledge and technology.

Course Outcomes: CO1_PGS504 Student will learn about basic instrumentation, its principles,

working and use. They will learn about Making solutions of different concentrations, learn acid base interaction. Also, students will learn about Procedural outline of various experiments. Student will learn about Basics of

plant tissue culture and seed viability testing.

Scheme of Studies:

Board Of Study	Course Code	Course Title	Scl	neme	of Stu	(Hours/Week)	Total Credit (C)	
			С	LI	S	SL	Total Study Hours	
			I		W			
NC	PGS504	Basic	0	2	00	00	2	01
		Concepts in	0					
		Laboratory						
		Techniques						

Legend:

CI:Classroom Instruction (Includes different instructional strategies i.e.Lecture (L)and Tutorial (T) and others),

LI:LaboratoryInstruction(IncludesPracticalperformancesinlaboratoryworksh op, field or other locations using different instructional strategies)

SW: Sessional Work(includes assignment, seminar, mini project etc.),

SL:Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and

feedback of teacherto ensure outcome of Learning.

Scheme of Assessment:

Practical

Boa	Cour	Course	Scheme of A	Assessment ((Marks)					
rd	se	Title								
of	Code									
Stu			Progressive	Assessment		End	Total			
dy			Class/Ho	Class	Semina	Class	Class	Total	Semester	Mark
			me	Test 2	r one	Activity	Attenda	Mark	Assessme	S
			Assignme	(2 best		anyone	nce	S	nt	(PRA
			nt 5	out of3)				(CA+C		+
			number3	10				T+SA+	(ESA)	ESA)
			mark	marks		(CAT)		CAT+A		
			seach(CA)	each(CT			(AT)	T)		
)						
NC	PGS	Basic							100	100
	504	Concep								
		ts in								
		Labora								
		tory								
		Techni								
		ques								

Course-Curriculum Detailing:

Laboratory techniques are important for any person conducting an experiment. Every procedure needs to be complete with accuracy and precision with proper safety measures. Student will understand the safety and details of working in scientific laboratory. Student will familiarize with various instruments and their principles. Student will practice and visualize common experimental procedures.

PGS504 Basic Concept of Laboratory Techniques

Approximate Hours

1.1	
Item	Appx Hrs
CI	00
LI	30
SW	00
SL	00
Total	30

Session Outcomes (SOs)	Laboratory Instructions (LI) 1 class= 2 hrs.	Classroom	Self-Learning
	1 Class= 2 Hrs.	Instructions (CI)	(SL)
SO.L1 Identify safety	L1. Safety measures while in		
measures while in Lab	Lab;		
SO.L2 Recognize use of	L2. Use of burettes, pipettes,		
glassware.	measuring cylinders, flasks,		
	separatory funnel, condensers,		
SO.L3 Discover handling of	micropipettes and vaccupets;		
glassware.			
	L3. Washing, drying and		
SO.L4 Recognize Drying of	sterilization of glassware;		
solvents/ chemicals;			
	L4. Drying of solvents/		

SO.L5 Describe working	chemicals;	
with chemicals.		
	L5. Handling of chemical	
SO.L6 Describe working	substances; Weighing and	
with solutions.		
with solutions.	preparation of solutions of	
	different strengths and their	
SO.L7 Articulate the	dilution;	
technique of formulating		
doses of agrochemicals	L6. Handling techniques of	
	solutions;	
SO.L8 Discover handling	,	
techniques of solutions	L7. Preparation of different	
teeninques of solutions	agro-chemical doses in field	
CO I O Identify the bondline	· ·	
SO.L9 Identify the handling	and pot applications;	
of acid and bases		
	L8. Preparation of solutions of	
SO.L10 Discover the	acids;	
formulation of buffer and		
solutions of specific pH.	L9. Neutralisation of acid and	
	bases;	
SO.L11 Identify the use of	ouses,	
lab instruments	L10. Preparation of buffers of	
lab ilistruments		
GOV 10 D	different strengths and pH	
SO.L12 Recognize and	values;	
categorize the media		
requirements and its types	L11. Use and handling of	
	microscope, laminar flow,	
SO.L13 Discover the	vacuum pumps, viscometer,	
methods and application of	thermometer,	
viability of germ plasm	magnetic stirrer, micro-ovens,	
viamity of germ plasm	incubators, sand bath, water	
SO.L14 Illustrate procedure	bath, oil bath;	
for plant tissue culture	Electric wiring and earthling;	
SO.L15 Recognize	L12. Preparation of media and	
flowering plant by its	methods of sterilization;	
taxonomical description		
	L13. Seed viability testing,	
	testing of pollen viability;	
	, ,	
	L14. Tissue culture of crop	
	plants;	
	piants,	
	1.15 D	
	L15. Description of	
	flowering plants in botanical	
	terms in relation to taxonomy	

Brief of Hours suggested for the Course Outcome

	Class			
Course Outcomes	lecture (CL)	Sessional Work (SW)	Self- Learning (SL)	Total hour (CL+SW+SL)
Basic Concept of Laboratory Techniques				
recliniques	0+30	0	0	30

Suggestion for End Semester Assessment:

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks	Total		
		R	U	A	Marks
CO1	Basic Concept of Laboratory Techniques		30	70	100

Suggested Learning Resources:

Sl. No.	Title	Author	Publisher	Edition and Year
01	Laboratory Techniques in Organic Chemistry	Jerry R. Mohrig, David G. Alberg, and Gretchen M. Adams	W. H. Freeman and Company.	2014
02	Biotechnology: Expanding Horizons	B D Singh	Kalyani Publishers	2005

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Cos, POs and PSOs Mapping Course Code:- PGS504

Course Title: - Basic concept in laboratory

Course	Program Ou	itcomes								Program Sp	ecific Outcome	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	C41-	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized and to	which will	practices soil	meth ods	practic	techniq	s to analyze	research work	in societal and		Agronomy.	administrati	_	
	provide	improve	fertilizer	colla	es, soil,	ues, resourc	their	WOLK	environme	inputs and			proble	that are
	knowledge	the	and	bora	fertiliz	es and	master		ntal	outputs in		ve and	ms of	occurrin
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	their		consultancy	existin	g in
	on	conditio	manage	with	water	it tools	work		and	agricultural		services.	g farm	local and
	regarding	n	ment of	stati	manag	in			demonstrat	field to			in the	global
	various	through	producti	stics	ement	improv			e the	make			periphe	agricultu
	technique	student'	ve crop	alon	and	ement			knowledge	effective			ry of	re and
	of farming	S	aspects.	g	plant	of			of, and	and			univers	how they
	and	contribu		with	protec	agrono			need for	profitable			ities.	will
	farming	tions.		eval	tion	mical			sustainable	decisions.				affect
	system in			uatio	econo	packag e and			developme nt in	То				futuristic
	India			n whic	mic associ	practic			Agricultur	understand				agricultu
				h	ated	es.			e.	the				re
				will	with	CB.			· .	mechanics				
				prov	farmin					of agri				
				ed to	g					Entreprene				
				deci	enterp					urship.				
				sion	rises.					ursinp.				
				in										
				vari										
				ous										
				part										

				of agric ultur e										
CO1- Basic Concept of Laboratory Techniques	1	1	1	1	1	1	1	3	1	1	1	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Basic concept in laboratory

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- Basic Concept of Laboratory Techniques .	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7 SO1.8 SO1.9 SO1.10 SO1.11 SO1.12 SO1.13 SO1.14 SO1.15		Unit-1 Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets; washing, drying and sterilization of glassware; Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution; Handling techniques of solutions; Preparation of different agrochemical doses in field and pot applications; Preparation of solutions of acids; Neutralization of acid and bases; Preparation of buffers of different strengths and pH values. Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sand bath, water bath, oil bath; Electric wiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability; Tissue culture of crop plants; Description of flowering plants in botanical terms in relationto taxonomy	As mentioned in page number



A K S University Faculty of Agricultural Science and Technology Department of Agronomy Curriculum of M.Sc. Agronomy

Course Code: Agron 599

Course Title: Research/Thesis

Pre- requisite: Conduct research to resolving the problem of farmers and society by applying

advanced technology adopted in field of Agronomy.

Rationale: The basic purpose of master's research is to understand the application of

research methodology tools to do research on particular topic related to Agronomy and follow technical writing skill to design the synopsis, thesis, research paper, abstract, articles, etc as per results obtained during research

studies.

Course Outcomes:

AGRO 599.1.Prepare various research activities related to Agronomy field and compose manuscript i.e., synopsis related to particular topic.

Scheme of Studies:

				Sche	Total				
Board of Study		Course Title	CI	LI	SW SL		Total Study HoursCI+LI+SW+ SL	Credits (C)	
	AGRO 599	Master Research	0	30	0	0	30	(0+15)= 15	

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies) **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

	Course	Course Title										
				Progressive Assessment (PRA)								
Boa			Class/Hom	ClassTe					End			
rd of Stu			e	st 2(2		Class	Class	Total	Semeste	_ 0000		
	Cod		Assignmen	bestout	Semin			Marks _{(C}	r	Marks(P		
	e		t 5	of3)10	arone	tyany	ance(A	A+CT+S	Assess	RA +		
dy			number3	marks	aronc	one(C	T)	\mathbf{A} +	ment	ESA)		
			markseach	each(C		AT)		CAT+AT)	(ESA)			
			(CA)	T)								
	AGRO		0	0	0	0	0	0	100	100		
	599	Research										

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

AGRO 599. 1 Prepare various research activities related to Agronomy field and compose manuscript i.e., synopsis related to particular topic.

Approximate Hours

	1.1
Item	Approximate Hours
CI	0
LI	30
\mathbf{SW}	0
SL	30
Total	60

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class	Self
		room	Learning
		Instructi	(SL)
		on (CI)	
SO1. Plan the proposal of research	1.1. Submission of research		1.Finding
related to the topic taken with the	proposal consisting concern		of reviews
help of guide	programme		related
SO2. Design the layout according to	1.2 . Explain definition of the		with the
topic	problems reference to topic		topic of
SO3. Describe the terminology	1.3 . Explanation of results		research.
related to the topic	1.4 . Arrange the references of past		2.Preparati
SO4. Plan the methodology to	work of 10 years		on of
conduct the research on the topic	1.5 . Collection of data by focusing		manuscript
SO5. Select the data to be taken	their objectives and observations to		s related to
during research	be taken mentioned in their		concerned
	synopsis		topic.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Lab	Self	Total hour
	Lecture	Instructi	Learning	(Cl+SW+Sl
	(Cl)	on (LI)	(Sl))
AGRO 599.1 Prepare various research activities				
related to Agronomy field and compose manuscript		30	30	60
i.e., synopsis related to particular topic.				

Total		30	30	60
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Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment. Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Group Discussion
- 3. Demonstration
- 4. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Research publications			
2	Science direct			
3	Research gate			
4	Pubmade			
5	Academia			
6	Multi authored books			
7	Book chapters			

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Cos, POs and PSOs Mapping Course Code:- Agron 599

Course Title: Research/Thesis

Course	Program O	utcomes								Program Sp	ecific Outcom	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding various	n through	ment of	stati	manag	in			demonstrat e the	effective and			ry of univers	re and
	technique	through student'	producti	stics alon	ement and	improv			knowledge	profitable			ities.	how they will
	of farming	Student	ve crop aspects.		plant	ement of			of, and	decisions.			mes.	affect
	and	contribu	aspects.	g with	protec	agrono			need for	To				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in	tions.		uatio	econo	packag			developme	the				re
	India			n	mic	e and			nt in	mechanics				
				whic	associ	practic			Agricultur	of agri				
				h	ated	es.			e.	Entreprene				
				will	with					urship.				
				prov	farmin					•				
				ed to	g									
				deci	enterp									
				sion	rises.									
				in										
				vari										
				ous										
				part										
				of										
				agric										

				ultur e										
CO1-Prepare various research activities related to Agronomy field and compose manuscript i.e., synopsis related to particular topic	2	3	3	2	3	3	2	1	3	3	3	2	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Research/Thesis

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1- Prepare	SO1.1	Submission of		As mentioned in page
7,8,9	various research	SO1.2	research proposal		number
PSO 1,2, 3, 4, 5	activities related to	SO1.3	consisting		
	Agronomy field and	SO1.4	concern		
	compose	SO1.5	programme		
	manuscript i.e.,		Explain		
	synopsis related to		definition of the		
	particular topic		problems		
			reference to topic		
			Explanation of		
	•		results		
			Arrange the		
			references of past		
			work of 10 years		
			Collection of		
			data by focusing		
			their objectives		
			and observations		
			to be taken		
			mentioned in		
			their synopsis		
			1.1,1.2,1.3,1.4,1.5		



A K S University Faculty of Agricultural Science and Technology

Department of Agronomy

Curriculum of M.Sc. (All Branches)

Course Code: - PGS 505

Course Title: - Agricultural Research, Research Ethics and Rural Development

Programmes

Pre requisite: - Student should have basic knowledge of agricultural research,

research ethics, and agricultural history along with fellowship

program, rural development programme.

Rationale: - The students studying agricultural research and research ethics

should possess understanding about method of research application, research ethics and fellowship for research and other scholars in construction agricultural development. This encompasses familiarity with the invention and evolution of agricultural research and development of agricultural programme, students ought to acquire fundamental insights into various agricultural technologies, their applications, as well as the Indian

needs in agricultural developments.

Course Outcomes:

PGS 505 CO 1: Identify the history, levels of research, economic and social welfare through research programme.

PGS 505 CO 2: Apply the functioning, role and significant of regional, national and international research.

PGS 505 CO 3: Asses the agricultural research, research ethics with operating and safety of laboratory.

PGS 505 CO 4: Analyze the various development programmes and their functioning with its impact on agricultural development

PGS 505 CO 5: Evaluate the role and functioning of panchayati raj, NGO and evaluation of different rural development program.

Scheme of studies

Catego ries of	Course Code	Course Title Scheme of studies (Hours/Week)						
course			C1	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	ts (C)
Non credit	PGS 505	Agricultural Research, Research Ethics and Rural	01	00	02	01	04	01
course (NCC)		Development Programmes						

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others).

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and

feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Catego ries of	Cours e	Course Title	Scheme of Assessment (Marks)							
course	Code			Prog	gressive A	ssessment (PRA)		End	Total
			Class/ Home Assign ment 5 numb er 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Semin ar one (SA)	Class Activity any one (CAT)	Class Attend ance (AT)	Total Marks (CA+C T+SA+ CAT+A T)	Semest er Assess ment (ESA)	Marks (PRA+ ESA)
(NCC)	PGS 505	Agricultural Research, Research Ethics and Rural Development Programmes	15	30	00	00	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

PGS 505 CO-1 Identify the history, levels of research, economic and social welfare through research programme

Approximate Hours

Approximate Hours								
Item	Appx Hrs							
C 1	3							
LI	0							
SW	2							
SL	1							
Total	06							

Session Outcomes	Laboratory	Class room	Self Learning
(SOs)	Instruction	Instruction	(SL)
	(LI)	(CI)	
SO1.1- Introduce		Unit-I	1.1- Prepare the
about the history of		History of	assignment on Global
agriculture in brief		agriculture in brief;	agricultural research
SO1.2 - Brief the basic		Global agricultural	system
concept global		research system:	System
agricultural research		need, scope,	
system.		opportunities; Role	
SO1.3 - Discuss about		in promoting food	
the need, scope,		security, reducing	
opportunities; Role in		poverty and	
promoting food		protecting the	
security of global		environment;	
agricultural research		National Agricultural	
system.		Research Systems	
SO1.4- Describes the		(NARS) and Regional	
reducing poverty and		Agricultural	
protecting the		Research	
environment through		Institutions;	
global agricultural		1.1- History of	
research system		agriculture in brief	
SO1.5 Asses the		1.2-Global agricultural	
functions and use of		research system: need,	
national Agricultural		scope, opportunities;	
Research Systems		Role in promoting	
(NARS) and Regional		food security, reducing	
Agricultural Research		poverty and protecting	
Institutions.		the environment	
		1.3- National	
		Agricultural Research	
		Systems (NARS) and	
		Regional Agricultural	
		Research Institutions	

SW-1 Suggested Sessional Work (SW):

- a. Assignments: Prepare the assignment on Global agricultural research system
- b. Mini Project: -
- c. Other Activities (Specify):-

PGS 505 CO 2: Apply the functioning, role and significant of regional, national and international research.

Approximate Hours

Item	AppX Hrs
C 1	3
LI	0
SW	1
SL	2
Total	06

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 – introduce to the Consultative Group on International Agricultural Research (CGIAR) SO2.2 – learned about the International Agricultural Research Centers (IARC), SO2.3- Briefing the partnership with NARS, role as a partner in the global agricultural research system SO2.4- Briefing the strengthening capacities at national levels; International fellowships for scientific mobility SO 2.5-Discuss to the strengthening capacities at regional levels; International fellowships for scientific mobility	LE2.1	Unit-II Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centers (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility 2.1 - Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centers (IARC) 2.2 - Partnership with NARS, role as a partner in the global agricultural research system. 2.3 -, Strengthening capacities at national and regional levels; International fellowships for scientific mobility.	2.1 – Prepare the assignment on partnership with NARS, role as a partner in the global agricultural research system

SW-1 Suggested Sessional Work (SW):

- **a. Assignments:** Prepare the assignment on partnership with NARS, role as a partner in the global agricultural research system.
- b. Mini Project:
- c. Other Activities (Specify):

PGS 505 CO 3: Asses the agricultural research, research ethics with operating and safety of laboratory.

Approximate Hours

Item	AppX Hrs
C 1	3
LI	0
SW	2
SL	1
Total	06

Session Outcomes	Laboratory	Class room	Self Learning
(SOs)	Instruction	Instruction	(SL)
	(LI)	(CI)	
SO3.1 – Identify to the	LE3.1	Unit-3	3.1 Prepare the
Research ethics		Research ethics:	assignment on
		research integrity,	Research ethic and
SO3.2 – Discuss to the		research safety in	research integrity.
research integrity,		laboratories, welfare	
research safety in		of animals used in	
laboratories		research, computer	
		ethics, standards and	
SO3.3- Apply the		problems in research	
welfare of animals		ethics	
used in research		3.1- Research ethic and	
SO3.4- Discuss to		research integrity	
computer ethics and			
standards		3.2- Research safety in	
CO2 5 Describe the		laboratories, welfare	
SO3.5— Describe the		of animals used in	
problems in research		research.	
ethics		3.3- Computer ethics,	
		standards and	
		problems in research	
		ethics.	

SW-1 Suggested Sessional Work (SW):

- a. Assignments: Prepare the assignment on Research ethic and research integrity
- b. Mini Project:
- c. Other Activities (Specify)

PGS 505 CO 4: Analyze the various development programmes and their functioning with its impact on agricultural development

Approximate Hours

Item	App X Hrs	
Cl	3	
LI	0	
SW	2	
SL	1	
Total	06	

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 –Identify the	LE1.1 -	Unit-4.0 - I	1.1- Prepare the
Concept and connotations		Concept and connotations	assignment on
of rural development.		of rural development,	Community
		rural development policies	Development
SO1.2 - Apply the rural		and strategies. Rural	Programme.
development policies and		development programmes:	
strategies		Community Development	
		Programme, Intensive	
SO1.3- Asses the Rural		Agricultural District	
development programmes:		Programme, Special group	
Community Development		- Area Specific	
Programme, Intensive		Programme, Integrated	
Agricultural District		Rural Development	
Programme.		Programme (IRDP)	
SO1.4- Describes the		4.1- Concept and	
		connotations of rural	
Special group – Area		development, rural	
Specific Programme.		development policies and	
SO1.5— Brief the		strategies	
Integrated Rural		4.2- Rural development	
Development Programme		programmes: Community	
(IRDP)		Development Programme,	
(IRDI)		Intensive Agricultural	
		District Programme	
		_	
		4.3- Special group – Area	
		Specific Programme,	
		Integrated Rural	
		Development Programme	
		(IRDP)	

SW-1 Suggested Sessional Work (SW):

- **a. Assignments:** Prepare the assignment on Community Development Programme
- **b. Mini Project:** Prepare a project report of leadership styles and influence process; leadership theories, leadership styles and effective leader
- c. Other Activities (Specify):

PGS 505 CO 5: Evaluate the role and functioning of panchayati raj, NGO and evaluation of different rural development program.

Approximate Hours

Item	AppX Hrs
Cl	06
LI	00
SW	02
SL	02
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)	
SO1.1 –Indentify Panchayati Raj Institutions and Co-	LE1.	Unit-5.0 Panchayati Raj Institutions, Co-operatives, Voluntary	assignment	the on Raj
operatives. SO1.2- Identify the Voluntary Agencies SO1.3- Identify the Non-Governmental		Agencies/Non-Governmental Organizations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural	Institutions,	
Organizations SO1.4- Discuss the , Critical evaluation of rural development policies		policies and programmes 5.1- Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/Non- Governmental Organizations		
SO1.5- Briefs the programmes. Constraints in implementation of rural policies and programmes		 5.2- Critical evaluation of rural development policies and programmes 5.3- Constraints in implementation of rural policies and programmes 		

SW-1 Suggested Sessional Work (SW):

- a. Assignments: Prepare the assignment on Panchayati Raj Institutions,
- b. Mini Project:
- c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Laborato	Sessional	Self	Total hour
	Lecture	ry	Work	Learning	(C l + LI +
	(C I)	Lecture	(SW)	(S I)	SW +S1)
		(L I)			·

PGS 505 CO-1 Identify the history, levels of research, economic and social welfare through research programme	3	0	2	1	06
PGS 505 CO 2: Apply the functioning, role and significant of regional, national and international research.	3	0	2	1	06
PGS 505 CO 3: Asses the agricultural research, research ethics with operating and safety of laboratory.	3	0	2	1	06
PGS 505 CO 4: Analyze the various development programmes and their functioning with its impact on agricultural development	3	0	2	1	06
PGS 505 CO 5: Evaluate the role and functioning of panchayati raj, NGO and evaluation of different rural development program.	3	0	2	1	06
Total Hours	15	00	10	05	30

Suggested Specification Table (For ESA)

CO	Unit title	M	arks Distr	ibution	Total
		R	U	A	Marks
CO-1	Identify the history, levels of research, economic and social welfare through research programme.	02	03	00	05
CO-2	Apply the functioning, role and significant of regional, national and international research.	02	05	03	10
CO-3	Asses the agricultural research, research ethics with operating and safety of laboratory.	00	08	07	15
CO-4	Analyze the various development programmes and their functioning with its impact on agricultural development.	02	05	08	15
CO-5	Evaluate the role and functioning of panchayati raj, NGO and evaluation of different rural development program	00	03	02	05
	Total	06	24	20	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Visit to Industry
- 7. Demonstration
- 8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Face book, Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming

Suggested Learning Resources:

S.	Title	Author	Publisher	Edition &
No.				Year
01	Indian Agriculture - Four	Bhalla GS & Singh	Sage Publ	2001
	Decades of Development	G.		
02	Manual on International	Punia MS	CCS, Haryana	
	Research and Research		Agricultural	
	Ethics		University, Hisar.	
03	Rural Development	Rao BSV.	Mittal Publ	2007
	Strategies and Role of			
	Institutions Issues,			
	Innovations and Initiatives.			
	Rural Development -	Singh K	Sage Publ	1998.
	Principles, Policies and			
	Management			

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Cos, POs and PSOs Mapping Course Code:- PGS 505

Course Title: - Agricultural Research, Research Ethics and Rural Development Programmes

POI POZ PO3 PO4 Detailed Knowled april for regardin agronomy will be made specialized and to provide Rowwide disseminant farmers on condition on condition on farming and farm	Course	Program Ou						/				ecific Outcom			
knowledge of various branches of agronomy ovarious branches of agronomy will be made specialized and to provide knowledge disseminati on regarding and various technique of farming and farming system in India India Ind	Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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CO-1	3	3	3	1	3	1	1	1	3	3	1	2	3	1
Identify the														
history, levels														
of research,														
economic and														
social welfare														
through														
research														
programme														
CO 2: Apply	3	3	3	2	3	1	1	1	3	3	1	3	2	1
the														
functioning,														
role and														
significant of														
regional,														
national and														
international														
research.														
CO 3: Asses	3	2	1	3	2	3	1	3	3	3	2	2	1	2
the														
agricultural														
research,														
research														
ethics with														
operating and														
safety of														
laboratory.														
CO 4:	3	2	1	3	1	3	1	1	1	3	1	3	2	1
Analyze the														
various														
development														
programmes														
and their														
functioning														
with its														
impact on														

agricultural development														
CO5:	3	1	2	3	1	3	1	1	1	2	3	1	1	1
Evaluate the														
role and														
functioning														
of panchayati														
raj, NGO and														
evaluation of														
different rural														
development														
program.														

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Agricultural Research, Research Ethics and Rural Development Programmes

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction		
			(LI)		
PO 1,2,3,4,5,6	CO1: Identify the	SO1.1		Unit-1.0	As mentioned in page
7,8,9 PSO 1,2, 3, 4, 5	history, levels of research, economic	SO1.2		History of agriculture in brief; Global agricultural research system: need, scope,	number
	and social welfare through research	SO1.3		opportunities; Role in promoting food security, reducing poverty and protecting	
	programme	SO1.4		the environment; National Agricultural	
		501.5		Research Systems (NARS) and Regional	
		SO1.5		Agricultural Research Institutions 1.1, 1.2, 1.3.	
PO 1,2,3,4,5,6	CO 2: Apply the	SO1.1		Unit-2.0 –	As mentioned in page
7,8,9	functioning, role and significant of	SO1.2		Consultative Group on International Agricultural Research (CGIAR):	number
PSO 1,2, 3, 4, 5	regional, national	SO1.3		International Agricultural Research	
	and international	001.3		Centers (IARC), partnership with NARS,	
	research.	SO1.4		role as a partner in the global agricultural	
				research system, strengthening capacities	

PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 3: Asses the agricultural research, research ethics with operating and safety of laboratory.	SO1.5 SO1.1 SO1.2 SO1.3 SO1.4	at national and regional levels; International fellowships for scientific mobility 2.1, 2.2, 2.3. Unit-3.0 Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics 3.1, 3.2, 3.3.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4: Analyze the various development programmes and their functioning with its impact on agricultural development	SO1.5 SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-4.0 Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group — Area Specific Programme, Integrated Rural Development Programme (IRDP) 4.1, 4.2, 4.3.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Evaluate the role and functioning of panchayati raj, NGO and evaluation of different rural development program.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-5.0 Panchayati Raj Institutions, Cooperatives, Voluntary Agencies/Non-Governmental Organizations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes 5.1, 5.2, 5.3.	As mentioned in page number



A K S University Faculty of Agricultural Science and Technology Department Of Agronomy Curriculum of M.Sc. Agronomy

Course Code: AGRO 599

Course Title: Research/Thesis

Pre- requisite: Conduct research to resolving the problem of farmers and society by

applying advanced technology adopted in field of Agronomy.

Rationale: The basic purpose of master's research is to understand the application

of research methodology tools to do research on particular topic related to Agronomy and follow technical writing skill to design the synopsis, thesis, research paper, abstract, articles, etc as per results obtained

during research studies.

Course Outcomes:

Agro 599 Propose research methodology tools for conducting research on selected topic of field of Agronomy and prepare Final manuscript i.e. Thesis

Scheme of Studies:

Board of	Course	Course Title		Scheme of studies(Hours/Week)							
Study	Course Code		CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	Credits (C)			
	AGRO 599	Master Research	0	30	0	0	30	(0+15)= 15			

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and

feedback of teacher to ensure outcome of Learning.

		Scheme of Assessment (Marks)											
				Progressive Assessment (PRA)									
	Cou		Class/Hom	Class		Class			End Semeste				
Boar	rse	Cour	e	Test 2(2		Activi	Class	Total	Marks r	Total			
d of	Cod e	se Title	Assignmen		Semin ar one	1 37	T)	(CA+CT+ SA+		Marks(P			
Study			t 5	of3)10					ment	RA +			
			number3	marks						ESA)			
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			(CA)	T)		-/			(-2)				
	Agro-	Master											
	599	Resear	0	0	0	0	0	0	100	100			
		ch											

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Agro- 599 Propose research methodology tools for conducting research on selected topic of field of Agronomy.

Approximate Hours

Item	Approximate Hours
CI	0
LI	30
SW	0
SL	30
Total	60

Session Outcomes (SOs)	` ′	Class room Instruction	Self Learning (SL)
		(CI)	, ,
SO1. Choose the topic and	1.1 Perform research work as		1. Finding of
objectives for the research	per their topic by using various		reviews related
SO2. Select the suitable data	tools and production technology		with the topic of
during the research	methods in particular season of		_

SO3. Assemble the data taken	crop.	research.
during the research for interpretation SO4. Arrange the whole work with the interpretate data SO5. Formulate the hypothesis according the final composition.	1.2. Collection of data1.3. Analysis and interpretation of data1.4. Submission of final thesis	2. Preparation of manuscripts related to concerned topic.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Lab	Self	Total hour
	Lecture	Instructi	Learning	(Cl+SW+Sl
	(Cl)	on (LI)	(Sl))
AGRO 599 Propose research methodology tools for conducting research on selected topic of field of Agronomy.		30	30	60
Total		60	60	60

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment. Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Group Discussion
- 3. Demonstration
- 4. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Research publications			
2	Science direct			
3	Research gate			
4	Pub made			
5	Academia			
6	Multi authored books			
7	Book chapters			

Curriculum Development Team:

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- 10. Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Cos, POs and PSOs Mapping Course Code:- AGRO 599

Course Title: Research/Thesis

Course	Program Ou	ıtcomes								Program Sp	ecific Outcome	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student'	ve crop	alon	and	ement			knowledge	profitable			ities.	will
	of farming	S	aspects.	g	plant	of			of, and	decisions.				affect
	and	contribu		with	protec	agrono			need for	То				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in			uatio	econo	packag			developme	the				re
	India			n	mic .	e and			nt in	mechanics				
				whic	associ	practic			Agricultur	of agri				
				h	ated	es.			e.	Entreprene				
				will	with					urship.				
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				ed to	g									
				deci	enterp									
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				in										
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				ous										
				part										

			of agric ultur e										
Propose research methodology tools for conducting research on selected topic of field of Agronomy.	3	3	2	3	3	2	1	3	3	3	2	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Research/Thesis Classroom Instruction (CI)

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1- 599 Propose	SO1.1	Perform		As mentioned in page
7,8,9	research	SO1.2	research work		number
PSO 1,2, 3, 4, 5	methodology tools	SO1.3	as per their		
	for conducting	SO1.4	topic by using		
	research on selected	SO1.5	various tools		
	topic of field of		and production		
	Agronomy.		technology		
			methods in		
	•		particular		
			season of crop.		
			Collection of		
			data analysis		
			and		
			interpretation of		
			data		
			Submission of		
			final thesis		
			based on the		
			research topic		
			1.1,1.2,1.3,1.4		