GPS Institute of Agricultural Management

Bangalore University

Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) Regulations for Post Graduate Diploma in Agricultural Management (PGDAM) 2018-19

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Post Graduate Diploma in Agricultural Management (PGDAM)

This is an initiative of Dr.G.P.Shetty Agri. Research and Educational Trust, to bridge the knowledge gaps in fulfilling needs of Agricultural science and technology interface with society. As the pioneering and unique higher education institution in agricultural management located in Bengaluru, the Institute imbibes business ideology with conglomeration of facets of technological aspects of farming, from seed to plate and beyond. The perspective plan of this organization is focused on offering "on farm" training in agricultural management towards enhancing hands-on skills. This initiative is borne out of an increasingly felt need of the farming sector since agricultural outreach efforts are weaning. As a pioneer Agri. Management School, the training module is based on a combination of teaching methods from case study to the best demonstrated exemplars used in most advanced management schools of India and abroad. The pedagogical and learning processes have evolved as dynamics of possibilities provided in this proposal. The institute is fully vibrant in developing excellence in teaching and training on par with any modern University standard, such that its graduates should be employable upon completion of their academic programme.

Objectives:

- To enhance skills and competencies of students in applied aspects of agricultural technologies, management, institutions, governance and transfer of technologies.
- To equip the farming and its service sector to professionalize their management skills for better use of technology including outreach
- To empower the farm science and technology operators for sustainable processes with improved decision making skills and competence of practical solutions.
- To establish educational facilities to prepare youth for careers in agricultural and related domains of management
- To provide latest agricultural management tools with knowledge and theories through practically designed problem-solving learning opportunities.
- Empower with requisite knowledge and skill so that the students gain confidence and be proficient in analyzing the dynamics and intricacies of issues and field problems at different levels.
- To engage with MNC's, Govt and other organizations for their participation in developing appropriate training methods for their need.
- Specific short term programs, both customized and generic, will be offered to enrich their knowledge base for their improved career prospects

1. **Choice Based Credit System(CBCS) and Continuous Assessment Grading Pattern(CAGP) Regulations for Post Graduate Diploma in Agricultural Management (PGDAM)**

1.1 Title – Commencement

These Regulations shall be called the University of Mysore regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for PGDAM under the regulation of **Specialized Programmes** of University of Mysore. These Regulations shall come into force from the academic year 2016-2017.

1.2 Programme offered:

1. **Post Graduate Diploma in Agricultural Management (PGDAM)** for one year-2 semesters

1.3 Eligibility:

A) Post Graduate Diploma in Agricultural Management (PGDAM)

1. The candidates must have studied any Bachelor degree in Agriculture/Horticulture/Forestry/Agrl.Engineering/Agrl.Marketing/Life science including Biotechnology or any Equivalent graduation from a recognized University.
2. 70% marks of the entrance test comprising written and oral interview and 30% marks of the bachelor degree examination excluding languages will be considered for preparing the merit list at the time of admission.

1.4 Definition

Course: Each course offered will have three components associated with the teaching-learning process of the course, namely:

(i) Lecture – **L** (ii) Tutorial – **T** (iii) Practical – **P**, where

L stands for Lecture session.

T stands for Tutorial session consisting of assignments, presentation and discussion / self-study / desk work/ brief seminar/ presentations by students and such other novel methods that make a student absorb and assimilate more effectively the contents delivered in the Lecture classes.

P stands for Practice session and it consists of Hands on experience in farming techniques / Laboratory Experiments/Crop production / Field Studies /Case studies / Intensive practice

exercises/market led extension that equip students to acquire the much required skill component.

In terms of credits, every one-hour session per week of L amounts to 1 credit per semester and a minimum of two hours session of T or P amounts to 1 credit per semester, over a period of one semester of 16 weeks for teaching-learning process inclusive of semester-end examination.

A course shall have either or all the three components. That means a course may have only lecture component or only practical component or combination of any two or all the three components.

The total credits earned by a student at the end of the semester upon successfully completing the course is L + T + P. The credit pattern of the course is indicated as L : T : P.

If the course is of 3 credits, then the different credit distribution patterns in

L : T : P format could be

1:1:1	0:1:2	0:2:1	3:0:0
0:3:0	0:0:3	1 : 2 : 0	

The course is of 2 credits then the different credit distribution patterns in

L : T : P format could be

1:1:0	1:0:1	0:1:1	2:0:0
0:2:0	0:0:2		

1.5 Scheme of Instruction

A Post Graduate Diploma in Agricultural Management (PGDAM) programme is of 2 semesters – one year duration of 40 credits. A candidate can avail a maximum of 4 semesters – 2 years as per double duration norm, in one stretch to complete PGDAM programme, including blank semesters, if any. Whenever a candidate opts for blank semesters, he/she has to study the prevailing courses offered by the department when he/she resumes his/her studies.

A candidate has to earn 40 credits for successful completion of PGDAM with the distribution of credits for different courses over different semesters as given in **Table 1**

Table 1: Programme outline for Post Graduate Diploma in Agricultural Management (PGDAM)

SEMESTER: I

Sl. No.	Course Title	Course Code	L : T : P	Credits
1	Soil & water conservation Dynamics-I	PGDAM/SWC-001	1 : 1 : 1	3
2	Soil and Plant Nutrition Dynamics-I	PGDAM/SND-001	1 : 1 : 1	3
3	Plant Health Dynamics-I	PGDAM/PHD-001	1 : 1 : 1	3
4	Sustainable Crop Production Dynamics-I	PGDAM/SCP-001	1 : 1 : 1	3
5	Agribusiness, Market Dynamics & Entrepreneurship Development-I	PGDAM/AMD-001	1 : 1 : 1	3
6	Farm Mechanization Dynamics-I	PGDAM/FMD-001	1 : 1 : 1	3
7	Project Work-I	PGDAM/PW-001	1 : 0 : 1	2
	Total Credits			20

SEMESTER: II

Sl. No.	Course Title	Course Code	L : T : P	Credits
1	Soil & water conservation Dynamics-II	PGDAM/SWC-002	1 : 1 : 1	3
2	Soil and Plant Nutrition Dynamics-II	PGDAM/SND-002	1 : 1 : 1	3
3	Plant Health Dynamics-II	PGDAM/PHD-002	1 : 1 : 1	3
4	Sustainable Crop Production Dynamics-II	PGDAM/SCP-002	1 : 1 : 1	3
5	Agribusiness, Market Dynamics & Entrepreneurship Dynamics-II	PGDAM/AMD-002	1 : 1 : 1	3
6	Farm Mechanization Dynamics-II	PGDAM/FMD-002	1 : 1 : 1	3
7	Project Work-II	PGDAM/PW-002	1 : 0 : 1	2
	Total Credits			20

Pedagogy

GPS institute aims at adapting pedagogy which is a combination of lectures, discussions, case studies, project work with at most importance to practical content. Nothing can be managed without adequate accounting. Hence the proper dynamics of learning processes made to a unique pedagogy entails working in teams, which encourages active participation as students learn to identify alternatives, evaluate options, assimilate multiple perspectives, foresee management problems and present their mindboggling insights along with real-life situations of farming and subsequent decision making process.

Instructional Techniques:

This is a full-time course of two semesters with theory on-field training and work experience. There are seven permanent instructors/managers who teach and coordinate as well as manage the farms and fields. The instructors work together to execute the curriculum and to deliver the course through a variety of instructional techniques, as outlined below:

1. Lectures, Tutorials and Workshops

Whole group classes, lectures, Tutorials and workshops provide an excellent interactive opportunity to share and disseminate the core information to the entire group and to provide the theoretical background for the skills being taught in the fields. Visiting scholars/adjunct faculty will be drawn from the rich pool of agricultural scientists, management experts, extension experts and agriculturists from different parts of Karnataka and India to cover the contemporary emerging issues in agricultural and agribusiness sectors. All efforts will be made to cater to individual skill development, relevant to overall capacity and aptitude.

2. Field based practice

Faculty members also lead field/garden walks, discussions and farm equipment demonstrations, allowing for students to have a more interactive learning experience. The objective is to infuse/impart core and professional skills among the students.

3. Field Trips

During the program operation, students will be exposed to different farm and garden operations through field trips. Opportunities abound for apprentices to organize their own informal field trips to interesting horticultural and agricultural sites in and around Bangalore area.

4. Project Work

Every student pursuing PG Diploma in agricultural management in any area of specialty must develop and conduct a small dissertation/project work based on the field work to address some problems of major concern. In this pursuit, each student is expected to achieve satisfactory performance. In the first semester, each student will be developing a small concept note and it will be operationalized in the second semester. This includes brief introduction of the project with back ground, identification of the issue for the project work, objectives of the project, inventory of brief review, methodology adopted, report writing with major results and discussions and a summary with lessons learnt from the project work. Further, the project is translated into a business proposal for commercialization and it will be evaluated for its economic viability. Thus, the project work enables the students to impart practical skills, competence and gain confidence to start their own business as entrepreneurs and in the process their soft skill will also be enhanced.

Instructional Content (These are appropriated to suit PGDAM)

The intention of the both courses is to provide students with a mastery of basic practical skills and concepts necessary for the efficient and sustainable management of Natural Resources, Soil fertility and Nutrition, Crop Production and Protection, Agricultural Engineering and Agribusiness, Market dynamics and entrepreneurship in the farms relevant to their basic education and aptitude. The routine activities of farming right from planning, production, care, and marketing forms the basis for this learning. Integrated into daily activities are discussions, talks, lectures, demonstrations, and investigations that help form the theoretical framework for the practical agricultural skills. Instruction generally falls into these categories:

- **Introduction:** Growing Methods — asexual/sexual plant propagation, cost effective greenhouse techniques, crop planning, bed preparation, transplanting and sowing, irrigation, crop care, cultivation, seed saving, post-harvest, economics and market botany and Crop Culture — botanical characteristics and cultural requirements of specific vegetable crops, herbs, flowers, fruits, and trees, and how they may be combined in a farm
- **Soil & water conservation Dynamics:** The course is designed, to increase the competence in areas of resource management, to ensure the scientific concepts for further

application, to provide the technical aspects of handling the risks of resource management, such as problematic soils, water scarcity, drought, climate vagaries etc, to analyze the rational of climate knowledge in various farm applications and to assess & use alternative knowledge systems in resource management. Soils — soil physical properties, soil/plant interactions, soil fertility management, soil testing, composting, and cover cropping

- **Soil and Plant Nutrition Dynamics:** The process includes the understanding of Physics, Chemistry & Biology of Plant Nutrition, Concepts in Fertility, Diagnostics and Remediation (Lab, Visual and Reference Methods), Soil Nutrient Management (Conventional and Alternative), Planning and Management strategies in nutrition

- **Plant Health Dynamics:** The course is aimed at familiarizing and hands on experiencing of the students with the concept of IPM, its advantages and disadvantages, Identifying various types of pest of crop plants, different sampling procedures, the correct procedure for sending the samples for identification and decision making based on ETL proportions. This course offers hands on and field based course to impart the practical applications in depth.

- **Sustainable Crop Production Dynamics:** The course is aimed at familiarizing cropping systems, Selection of Crops and Varieties, Planting Techniques, Inter-cultivation, Crop rotation, Cover crops/green manures, Plant nutrition, Water management, Growth and Development, Problem Diagnostics and Treatment Decisions, Precision agriculture, risk and uncertainty, harvesting and post-harvest handling, Material Handling in its' integration.

- **Farm Mechanization Dynamics:** Tractor Driving and their control systems, Study of appropriate Agricultural Machinery, Farm Mechanization, Farm machinery maintenance and Management, Custom hiring, Precision farming techniques, Latest Irrigation Techniques, Renewable energy sources and Post-harvest operations of agricultural produce.
- **Agribusiness, Market Dynamics and entrepreneurship Development:** Identification of investment opportunities/viable schemes, Project appraisal measures, Business plans for high value enterprises, concepts of agribusiness and markets, markets reforms, Agricultural input marketing, value chain in agricultural marketing, Market strategies,,

market information systems, market research, time series analysis and different phases of entrepreneurship development.

This is a full-time residential program involving theory, tutorial and practical classes with field work spread over six days a week. The program's work, class, and activity schedule is generally from 9:00 AM - 12:00 noon and 1:00 PM - 4:00 PM on weekdays. Candidates are expected to participate fully in the program by being available for those hours every day. Candidates will get the maximum out of this experience by coming prepared physically, and emotionally to make the program their singular focus for two semester period.

2.0 Continuous Assessment Earning of Credits and Award of Grades

The evaluation of the candidate shall be based on continuous assessment. The structure for evaluation is as follows:

2.1 Assessment and evaluation processes happen in a continuous mode. However, for reporting purposes, a semester is divided into 4 discrete components identified as C_1, C_2, C_3 and C_4.

2.2 The performance of a candidate in a course will be assessed for a maximum of 100 marks as explained below.

2.2.1 The first component (C_1), of assessment is for 20 marks. This will be based on test, assignment, practical manual and seminar. During the first component of the semester, the first 25% of the syllabus will be completed. This shall be consolidated during the 4th week of the semester. Beyond 4th week, making changes in C_1 is not permitted.

2.2.2 The second component (C_2), of assessment is for 20 marks. This will be based on test, assignment, practical manual and seminar. During the second component of the semester, another 25% of the syllabus will be completed. This shall be consolidated during the 8th week of the semester.

2.2.3 The third component (C_3), of assessment is for 20 marks. This will be based on test, assignment, practical manual and seminar. During the third component of the semester, another25% of the syllabus will be completed. This shall be consolidated during the 12th week of the semester.

2.2.4 The fourth component (C_4), of assessment is for 40 marks. The final assessment (C_4) will be split into two parts which includes an internal review assessment for 10 marks and an external review assessment for 30 marks. This shall be consolidated during the 15th-16th week of the semester. A student must secure 40 % in the external component to get through pass marks.

2.2.5 The outline for continuous assessment activities for Component-I (C_1), Component-II (C_2), Component-III (C_3) and Component-IV (C_4) will be proposed by the teacher(s) concerned before the commencement of the semester and will be discussed and decided in the respective Departmental Council. The students should be informed about the modalities well in advance. The evaluated courses/assignments during Component-I (C_1), Component-II (C_2), Component-III (C_3) and Component-IV (C_4) of assessment are immediately returned to the candidates after obtaining acknowledgement in the register maintained by the concerned teacher for this purpose.

Setting questions papers and evaluation of answer scripts.

I. Questions papers (for C_4) in three sets shall be set by the internal examiner of a course. Whenever there are no sufficient internal examiners, the chairman of BoE shall get the questions papers set by external examiners.

II. The Board of Examiners shall scrutinize and approve the question papers and scheme of valuation.

III. (i) There shall be single valuation for all theory papers by external examiners.

(ii) The examination for Practical work/ Field work/Project work/Internship will be conducted internally.

IV. Challenge valuation

A student who desires to apply for challenge valuation shall obtain a photo copy of the answer script by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the grade awarded to him/her by surrendering the grade card and by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 15 days after the announcement of the results. This challenge valuation is only for C_4 external assessment component.

The answer scripts for which challenge valuation is sought for shall be sent to another examiner. The higher of two marks from first valuation and challenge value shall be the final.

2.2.6 If **X** is the marks scored by the candidate out of 40 in C_4 in theory examination, if **Y** is the marks scored by the candidate out of 40 in C_4 in Practical examination and if **Z** is the marks scored by the candidate out of 40 in C_4 for a course of (L=0):T:(P=0)type that is

entirely tutorial based course, then the final marks M in C_4 is decided as per the following table.

L.T.P distribution	**Final mark M in C_4**
L:T:P	$\frac{[(L+T)*X]+[(T+P)*Y]}{L+2T+P}$
L:(T=0):P	$\frac{(L*X)+(P*Y)}{L+P}$
L:T:(P=0)	X
L:(T=0):(P=0)	X
(L=0):T :P	Y
(L=0): (T=0):P	Y
(L=0): T:(P=0)	Z

2.2.7 The details of continuous assessment are summarized in the following Table.

Component	**Syllabus**	**Weightage**	**Period of Continuous assessment**
C_1	First 25%	20%	To be consolidated by 4th week
C_2	Second25%	20%	To be consolidated by 8th week
C_3	Third 25%	20%	To be completed during 12th Week.
C_4	Semester-end examination (All units of the course)	40%	To be completed during 15th-16th Week.
	Final grades to be announced latest by 20th week		

2.2.8 A candidate's performance from all 4 components will be in terms of scores, and the sum of all 4 scores will be for a maximum of 100 marks (20 + 20 + 20 + 40).

2.2.9 A candidate has to secure 40 out of 100 ($C_1 + C_2 + C_3 + C_4$) marks to get successfully pass in the examination.

2.2.10 Finally, awarding the grades should be completed latest by 20th week of the semester.

2.3 Project Evaluation

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition to the regular discussion with the guide. Components of evaluation are as follows.

Component – I(C_1): Periodic Progress and Progress Reports (20%)
Component – II(C_2): Results of Work and Draft Report (20%)
Component– III(C_3): Final Report submission with viva (60%). The report evaluation is for 40% and the Viva-voce examination is for 20%

2.4 In case a candidate secures less than 50% in C_1, $C_2$and C_3put together in a course, the candidate is said to have DROPPED that course, and such a candidate is not allowed to appear for C_4 in that course.

In case, a candidate's class attendance in a course is less than 75% or as stipulated by the University, the candidate is said to have DROPPED that course, and such a candidate is not allowed to appear for C_4 in that course.

Teachers offering the courses will place the above details in the Department Council meeting during the last week of the semester, before the commencement of C_3, and subsequently a notification pertaining to the above will be brought out by the Chairman of the Department before the commencement of C_4 examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

2.5 In case, a candidate secures < 40% in C_4, he/she may choose DROP/MAKE-UP option. The candidate has to exercise his/her option to DROP immediately within 10 days from the date of notification of results.

A MAKE UP examination in the subsequent semester courses will be conducted for the DROP option candidates. . If a candidate is still unsuccessful, he/she may opt for DROP or again take up MAKE UP examination; however, not exceeding double the duration norm in one stretch from the date of joining the course.

2.6 A candidate has to re-register for the DROPPED course when the course is offered again by the department. A candidate who is said to have DROPPED project work has to re-register for the same subsequently within the stipulated period. <u>The details of any dropped course will not appear in the grade card.</u>

2.7 The tentative / provisional grade card will be issued by the Registrar (Evaluation) at the end of every semester indicating the courses completed successfully. This statement will not contain the list of DROPPED courses.

2.8 Upon successful completion of PGDAM programme a final grade card consisting of grades of all courses successfully completed by the candidate will be issued by the Registrar (Evaluation).

2.9 The grade and the grade point earned by the candidate in the subject will be as given below.

Marks	**Grade**	**Grade Point (**GP = V x G)
30-39	4	V*4
40-49	5	V*5
50-59	6	V*6
60-64	6.5	V*6.5
65-69	7	V*7
70-74	7.5	V*7.5
75-79	8	V*8
80-84	8.5	V*8.5
85-89	9	V*9
90-94	9.5	V*9.5
95-100	10	V*10

Here, P is the percentage of marks [P= (C_1+C_2+C_3+M (C_4))] secured by a candidate in a course which is rounded to nearest integer. V is the credit value of course. G is the grade and GP is the grade point.

2.10 Overall cumulative grade point average (CGPA) of a candidate after successful completion the required number of credits (40) is given by

CGPA = ΣGP / Total number of credits

2.11 Classification of results

The final grade point (FGP) to be awarded to the student is based on CGPA secured by the candidate and is given as follows.

CGPA	FGP	
	Numerical Index	Qualitative Index
4<= CGPA <5	5	SECOND CLASS
5 <= CGPA < 6	6	
6 <= CGPA < 7	7	FIRST CLASS
7 <= CGPA < 8	8	
8 <= CGPA < 9	9	DISTINCTION
9 <= CGPA < =10	10	

Overall percentage=10*CGPA or is said to be 50% in case CGPA<5

- **Medium of Instruction**

  The medium of instruction shall be English. Candidate will have to write the examinations in English.

- **Provision for appeal**

  If a candidate is not satisfied with the evaluation of C1, C2 and C3 components, he / she can approach the grievance cell with the written submission together with all facts, the assignments, and test papers etc, which were evaluated. He/she can do so before the commencement of semester-end examination. The grievance cell is empowered to revise the marks if the case is genuine and is also empowered to levy penalty as prescribed by the university on the candidate if his/her submission is found to be baseless and unduly motivated. This cell may recommend taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the grievance cell is final.

  For every program there will be one grievance cell. The composition of the grievance cell is as follows.

  1. The Registrar (Evaluation) ex-officio Chairman / Convener
  2. One senior faculty member (other than those concerned with the evaluation of the course concerned) drawn from the department/discipline and/or from the sister departments/sister disciplines.
  3. One senior faculty members / subject experts drawn from outside the University department.

SYLLABUS – PGDAM

SEMESTER-I

Name of Module	Course Number	Credit
SOIL & WATER CONSERVATION DYNAMICS -I	PGDAM/SWC-001	3 (1+1+1)

Course Description

The course is designed to increase the competence in the area of resource management to ensure the scientific concepts for further application to provide the technical aspects of handling the risk in resource management, such as problematic soils, water scarcity, drought, climate vagaries etc, to analyze the rational of climate knowledge in various farm applications and to assess & use alternative knowledge systems in resource management. Soil physical properties, soil/plant interactions, soil fertility management, soil testing, composting, and cover cropping

Learning Outcomes

- Upon successful completion of this module, students will be able to:
- Assess the soil of any given location for its properties
- Classify the soil for its suitability for different crop production system
- Assess the soil for its weld ability and design and develop a suitable conservation plan

AREAS OF COMPETENCY:

SOIL MANAGEMENT

I. BASIC PROPERTIES OF SOIL
II. LAND CHARACTERIZATION
III. SOIL EROSION AND CONSERVATION

WATER MANAGEMENT

IV. WEATHER AND CLIMATE
V. WATER AND SOLUTE MOVEMENT
VI. SOIL-PLANT-WATER RELATION

I. BASIC SOIL PROPERTIES

Study of soil properties like texture and its types, Structure and its types, bulk density, particle density and factors affecting porosity. Available water and factors influencing water

holding capacity. Effect of soil texture and soil structure on permeability, root development, water infiltration, aeration, thermal conductivity and hydraulic conductivity. Study of soil chemical properties like pH, EC and ion exchange, cation exchange capacity, anion exchange capacity, redox potential and factors of influence. Study of soil organic matter, composition, decomposition and fractionation. Effect of soil organic matter on soil physical and chemical properties. Effect of temperature, moisture, aeration, soil pH, EC, salinity and tillage on soil organic matter. Uses of soil organic matter, carbon cycle and C:N ratio, its effect on soil organic matter decomposition.

II.LAND CHARACTERIZATION

Study of parent material and soil horizons (O, A, E, B and C), Study of slope of landscape, Characteristics of well drained and poorly drained soils, land capability classification

III. SOIL EROSION AND CONSERVATION

Study of erosion, stages of erosion and types of erosion, Water erosion, types of water erosion, characteristics and factors affecting water erosion and their controlling measures, Wind erosion, types of wind erosion, characteristics, factors affecting wind erosion and their controlling measures

VI.WEATHER AND CLIMATE

Precipitation, forms of precipitation and distribution and pattern of rainfall, Effect of rainfall on crop production, Mitigation of frost effects on crop, Mitigation of thermal heat effect on crops, Study of micro climate and its effect on crop growth

V.WATER AND SOLUTE MOVEMENT:

Movement of soil water, factors influencing surface runoff and factors influencing leaching

VI. PLANT AND WATER RELATIONS:

Study of water cycle and factors influencing water cycle, Evapo-transpiration and factors influencing evapo-transpiration, Management options for reduction of evapo-transpiration, Effect of soil moisture deficiency on plant nutrient availability and uptake, Water use efficiency and measures to increase water use efficiency

LIST OF PRACTICALS

1. Study of important soil classification units like soil series, soil type and soil map unit. and Practical observation and delineation of soil horizons

2. Study of different parent materials (loess, limestone, shale, sandstone, colluvium, alluvium, etc.) and their influence on soil properties like texture, bulk density, water relationships, landscape shape and position, erosion potential.

3. Understand the relationship between soil consistency and tillage conditions; the “ball test”

4. Soil structure and determine its relationship to each of the following: a) crop growth and production, b) tillage and cropping system, c) soil organisms, and d) soil drainage.

5. Determination of soil organic matter and its relationship to each of the following: a) soil color, b) soil structure, c) nutrient supply, and d) soil erosion.

6. Simulation studies on different types of erosion and erosion control practices

7. Recognize properties that affect potential erosion: a) texture, b) organic matter, c) surface cover (rock and plant), d) % slope, e) length of slope, f) permeability, and g) structure

8. Recognize how each of the following factors influence the selection and use of tillage systems: a) crop rotation/field history, b) field design, c) soil properties, d) crop productivity potential, and e) costs

9. Describe the influence of tillage systems and tillage implements on each of the following: a) soil disturbance, b) crop residue remaining on the soil surface, c) incorporation of fertilizers, lime, and pesticides, and d) compaction.

10. Recognize how each of the following factors affect soil residue cover: a) cropping rotation, b) crop yield, c) harvesting methods, d) weather, e) tillage system, and f) fertilizer and manure methods.

11. Measurement of Rainfall, Temperature and wind speed in the observatory

Name of Module	Course Number	Credit
SOIL AND PLANT NUTRITION DYNAMICS-I	PGDAM/SND-001	3 (1+1+1)

Course Description:

The objective of this course is to introduce student to the concepts in Plant nutrition and the methods of deriving them from the soil. Concepts will include chemical and physical properties of soils, fundamentals of soil survey and classification, and interactions of soil colloids and other soil constituents to mineral nutrition. Fundamentals of soil biology, organic matter development and dynamics of plant nutrition will be discussed. Soil conservation and improvement, erosion prevention strategies, drainage, tillage and irrigation will be addressed.

Learning Outcomes

- To explain correlations between structure and function at the cell, tissue and whole plant level with respect to nutrients
- To describe and explain metabolism of plant cell and basic physiological processes in plant nutrition
- To conclude about the role of physiological and metabolic processes and correlations between them to understand the nutrition
- To apply practical skills in solving problems in plant nutrition
- Describe the relationship between soil organic matter and texture relative to nutrient adsorption, soil mobility, and availability for plant uptake.
- List all essential elements required for normal plant growth, development and reproduction and the charge associated with each element and its role in soil mobility.

AREAS OF COMPETENCY:

I. BASIC CONCEPTS OF PLANT NUTRITION
II. BASIC CONCEPTS OF SOIL FERTILITY
III. SOIL TESTING AND PLANT TISSUE ANALYSIS

I. BASIC CONCEPTS OF PLANT NUTRITION

Essential elements for plant nutrition, Classification of the essential elements as primary, secondary, and micronutrient, Functions of each essential element in plants, Classification of

each nutrient as mobile or immobile in the plant and in the soil, chemical uptake forms of each nutrient, nutrient demand change during different stages of the plant growth. N, P, K, Ca, Mg, S, Zn, B. Mo, Cu Mn, Fe nutrient deficiency symptoms in principal crops. Importance of nutrient balance and interaction on crop growth. Advantages and Disadvantages of Foliar Vs Soil application

II.BASIC CONCEPTS OF SOIL FERTILITY

Role of the following in supplying nutrients from the soil: Soil solution, cation exchange, organic matter, Soil minerals and Plant Residues. Mass flow, diffusion, and root interception of nutrients. Influence of Cation Exchange Capacity (CEC) in the mobility and availability of Calcium (Ca), Magnesium (Mg) and Potassium (K). Soil characteristics: Texture, Structure, Aeration, Moisture, pH, Temperature, Soil depth and effect on nutrient availability and uptake. Crop rotation, fallowing, crop diversification and growing multiple crops for efficient utilization of nutrients. Fate of N in soil: Fixation by clay, Ammonification/mineralization, Nitrification/denitrification, Volatization, Immobilization, Leaching, Biological N Fixation, Plant uptake, pH, Moisture, Nitrogen level, Presence of proper Rhizobia species, Phosphorus level and Flooding/Aeration. P availability in soil: pH, Moisture, Organic matter, P fixing capacity, Micro-Organisms, Liming & Gypsum amendments and Crop growth. K availability in the soil: Texture, Soil depth, pH and Liming, K bearing minerals, Type of clay, Soil moisture and Source and quality of irrigation water. Availability of secondary and micro nutrients in soils: Texture, pH, Soil Type and Crop grown. Crops and cropping systems influence over the following: Soil fertility levels, Method of applying nutrients, Timing of applying nutrients and Crop nutrient needs.

III. SOIL TESTING AND PLANT TISSUE ANALYSIS

Obtaining a representative soil sample in the following: Field crop, Orchard, Problem soils/soil colour/contour. Effect of the following on soil sampling methods: Method of previous fertilizer application, Nutrient stratification, Within-field soil and crop variability, Predictive vs. diagnostic sampling. Recommendations based on soil analysis report: Problem soil diagnosis, Nutrient program monitoring, In-season nutrient management, Pre-season nutrient planning, variability in soil test results: Time of sampling, Depth of sampling, Types of extraction method used, Number of samples per acre/hectare, Number of subsamples per sample, Approaches for making fertilizer recommendations: Sufficiency level, Critical level, Base saturation, Recognize how the following affect soil test interpretation: Probability of

crop response to added nutrients, Reported nutrient sufficiency level, Results reported as ppm or kg/ha, Within-field variability, Environmental risk, Soil texture. Effect of season on crop nutrient requirements: Rabi (winter) and Kharif (rainy) season, Target yield. Recognize how the following terms relate to plant nutrient level: Critical Value, Sufficiency level, Luxury consumption, Toxicity level. Recognize how the following affect plant tissue analysis results: Crop species, Growth stage, Plant part sampled, Crop stress level, Time of day when sampled, Sample handling, Method and timing of nutrient application, use of a chlorophyll meter or leaf color chart to assess nitrogen level.

LIST OF PRACTICALS

1. In field soil health assessment, Soil health measurements
2. Soil Sampling Methods and Procedures in the agricultural field
3. Sample processing and submission to nearby soil testing laboratory for analysis
4. Soil Analysis Report Interpretation and recommendations and Soil Quality assessment as per USDA, NRCS methods
5. Calculation of Fertility Index values and Plant Nutrient Recommendations based on soil test reports
6. Selection of suitable Fertilizers/ Manures for soil application based on soil test analysis.
7. Methods of Fertilizer/Manure application and use of fertilizer applicator.
8. Root Health Assessment in the field
9. Diagnosis of N, P, K, S, Zn, Mn, Fe nutrient deficiency symptoms in rice, wheat, maize, potato, cotton, sugarcane, mustard, cauliflower, tomato and pearl millet
10. Field evaluation of Diagnostic procedures
11. Characterization of acid, acid sulfate, salt-affected and calcareous soils at the field level
12. Determination of cations (Na+, K+, Ca++ and Mg++) and Anions (Cl-, SO4--, CO3-- and HCO3-) in ground water and soil samples in the field.
13. Lime and gypsum requirements and calculation
14. Visit to the soil testing / Plant testing laboratories and acquainted with advanced and sophisticated instruments like ICP, GCMS, IR, Contra AA, etc.
15. Draw the curves for nutrient requirement and ideal manure application for different crops on charts.

Name of Module	Course Number	Credit
PLANT HEALTH DYNAMICS-I	PHD-001	3 (1+1+1)

Course Description

The course is aimed at familiarizing and hands on experiencing of the students with the concept of IPM, its advantages and disadvantages, Identifying various types of pest of crop plants, different sampling procedures, the correct procedure for sending the samples for identification and decision making based on ETL proportions. This course offers a hands on and field based course to impart the practical applications in depth.

Learning Outcomes

Upon successful completion of the modules, the students will be able to;

- Perform the IPM at the field level
- Perform the various sampling procedures
- Determine the ETL and be able to make decisions

AREAS OF COMPETENCY:

I. BASIC CONCEPTS OF PEST MANAGEMENT
II. SAMPLING AND MONITORING
III. IDENTIFICATION
IV. DECISION-MAKING GUIDELINES

I. BASIC CONCEPTS OF PEST MANAGEMENT

Principles of Integrated Pest and Disease Management. Strategies to construct an effective IPM program**.** Steps involved in IPM program. Economic and environmental advantages of IPM. Factors limiting the use of IPM. Factors effecting insect pest population development. Characteristics of insect that influence their ability to cause damage. Environment, host plant and pathogenic/pest interaction to that cause plant disease. Infection, survival and dispersal of plant pathogens. Effect of temperature and moisture on survival of pathogens/pests. Factors affecting the ability of weeds to survive and be competitive.

II.SAMPLING AND MONITORING

Advantages of pest sampling methods. Factors that aid in monitoring pests. Collection of representative sample from different pest distribution patterns. Preparation and ship samples to a laboratory for identification/evaluation. Supporting information for submitting a sample for identification/evaluation. Advantages and disadvantages of different systems to monitor pest infestation and/or infection.

III.DIAGNOSTIC IDENTIFICATION

Classification of insect pest, diseases and weeds. Identification of mites and insects in adult stage& larval stages, diseases, nematodes and weeds in different agro-ecosystems.

IV.DECISION-MAKING GUIDELINES

Economic threshold, economic injury level and action threshold level. Natural enemies impact pest population projections. Pest management decisions

LIST OF PRACTICALS

1. Methods for sampling and submitting plant, soil, and pest & disease materials for analysis and diagnosis.
2. Field study of symptoms and patterns of insect damage
3. On Field identification of insect pests- Eggs and Larval Stage
4. On field identification of insect pests- Adult Stage
5. Collection and or rearing of insects for understanding the life cycle
6. Study of population and generations per season
7. On field identification plant diseases
8. Laboratory identification of Plant diseases caused by fungi, bacteria, virus, nematode,
9. Seed borne diseases and storage pests
10. Collection and preservation of pest. Dry/wet herbaria.

Name of Module	Course Number	Credit
SUSTAINABLE CROP PRODUCTION DYNAMICS-I	PGDAM/SCP-001	3 (1+1+1)

Course Description

The course is aimed at familiarizing and hands on experiencing of the students with sustainable crop production dynamics relating to crop and variety selection, planting techniques, inter-cultivation, crop rotation, cover crops/green manures, plant nutrition, water management, harvesting and post-harvest handling.

Learning Outcomes

Upon the completion of course module, the student will be in a position to:

- Learn an array of crop production methods - sustainable, organic, conventional
- Understand the principles of sustainable crop production
- Learn common sustainable and viable agronomic innovations
- Be able to synthesize crop production practices and apply on the farm

AREAS OF COMPETENCY:

I. FARMING SYSTEMS
II. HYBRID AND VARIETY SELECTION
III. CROP ESTABLISHMENT
IV. CROP GROWTH, DEVELOPMENT AND DIAGNOSTICS

I.CROPPING SYSTEMS

Types of cropping systems (Field and horticulture). Characteristics of different farming systems. Agro-climatic zones in India. Characteristics of different cropping systems. Role of different cropping system. Factors Influencing cropping sequence in rotation. Conventional and conservation tillage systems. Concept of Allelopathy.

II. HYBRID AND VARIETY SELECTION

Variety and Hybrid. Importance of variety diversification in crop production. Factors influencing variety/ hybrid selection or planting material. Farmers participatory variety selection (PVS). On-farm demonstration. Importance of randomization and replication in field trials. Use of least significant difference (LSD) value to intercept differences among treatments.

III. CROP ESTABLISHMENT

Seed quality. Seed tag information to determine seed quality. Induced and forced dormancy. Influence of pre and post-harvest conditions on seed quality. Advantages and limitations of seed treatments. Advantages and limitations of bio-inoculants/bio-fertilizers. Profitable quality seed production. Effect of storage time, handling, and storage conditions on quality of bio-inoculants/bio-fertilizers/seeds. Direction for apply seed treatment. Use and limitations of the standard germination test. Difference between grain used for seed and grain used for marketing. Use of purity and germination information in calculation of seed rate. Different seeding techniques. Advantages and limitations of transplanting and direct seeding of rice. Factors effecting seed germination. Effect of depth of planting and soil crusting on crop emergence. Identification of factors that influence planting date. Identification of consequences of seeding earlier or later than optimum. Factors effecting seeding rates. Advantages and limitations of application of fertilizer at seeding. Determination of plant population in field. Determination of seeding rate, plant population and harvest population. Nursery seed/ seedling production.

IV. CROP GROWTH, DEVELOPMENT AND DIAGNOSTICS

Difference between crop growth and development. Crop growth stages. Effect of temperature and moisture on crops at different growth stages. Effect of day length on flowering in short day, long day, and day neutral crops. Locating the growth points in grasses and broadleaf plants. Factors effecting crop canopy closure. Difference between summer annual, winter annual, biennial and perennial. Effect of soil factors on crop root growth. Factors differ for tap and fibrous root systems. Factors affecting the economies of replanting/gap filling. Information needed to diagnose a cropping problem.

LIST OF PRACTICALS

1. Hands on Identification of Varieties/ Hybrids/land race/ composite/germplasm of important crops, off types and roughing in seed production (Field and Horticulture).
2. Farmer Participatory Variety Selection in the field
3. Quality seed selection and testing Procedure, Use of seed tag information
4. Determination of Purity of the selected seeds
5. Study of seed dormancy in the lab
6. Seed treatment of Pesticides, Methods and practices
7. Seed treatment with bio-inoculum- Methods and practices
8. Land preparation for nursery and seeding techniques

9. Practical's on sowing of seeds and methods including nursery management
10. Fertilizer application methods- traditional and innovative
11. Studying the crop growth stages at the field- Germination and Emergence
12. Studying the crop growth stages at the field- Flowering and seed development
13. Study the effect of temperature and moisture extreme on plant growth- pot culture under controlled conditions
14. Study of day length on plant growth under controlled conditions based on light intensity measurements
15. Study by dissecting and analyzing the root systems of selected crops

Name of Module	Course Number	Credit
AGRIBUSINESS, MARKET DYNAMICS & ENTRPRENSRSHIP DEVELOPMENT-I	PGDAM/AMD-001	3 (1+1+1)

Course Description:

Identification of investment opportunities/viable schemes, Project appraisal measures, Business plans for high value enterprises, concepts of agribusiness and markets, markets reforms and entrepreneurship development

Learning Outcomes:

Upon successful completion of course modules, students will be able to:

1. Writing agribusiness Plans for high tech agricultural enterprises and acquaint with guidelines to start farm enterprises
2. Documenting and analyzing Government Developmental Schemes/Programmes in Vogue and success stories of agri-preneurs for availing benefits
3. Estimating demand for farm inputs and analyzing market channels and price spread
4. Market Survey and Analysis, study of market strategies and product development
5. Understanding the concept of entrepreneurship

AREAS OF COMPETENCY:

I. ECONOMIC ANALYSIS OF AGRICULTURAL PROJECTS/SCHEMES,
II. CONCEPTS OF AGRICULTURAL MARKETING MANAGEMENT
III. MARKET REFORMS-AGRICULTURAL MARKETING LEGISLATION AND POLICIES
IV. ENTRPRENERSHIP DEVELOPMENT AND AGRIBUSINESS PLAN

I. ECONOMIC ANALYSIS OF AGRICULTURAL PROJECTS/INNOVATIONS

Economic evaluation of different Government schemes that are in vogue for their effectiveness. Identification of investment opportunities in agribusiness enterprises. Documentation of export procedures/formalities/good management practices and assessing the export potential. Cost Benefit Analysis of agricultural projects /innovations/ interventions, Market appraisal, Estimation of Rate of Returns to Investments**.** Preparation of Business plans for High Tech Agricultural Enterprises.

II. CONCEPTS OF AGRICULTURAL MARKETING AND MANAGEMENT

Marketed and marketable surplus. Factors influencing marketed/market surplus, Classification of markets-buyers and sellers markets. Rural marketing and its importance. Approaches to the study of marketing. Marketing functions-Meaning and classifications. Packaging, transportation, grading and standardization, warehousing, processing, market information and intelligence, financing and risk management. Marketing institutions, agencies and marketing channels. Marketing costs, margins, price spread and marketing efficiency and their determinants. Regulation of agricultural marketing, objectives and importance. Retail market chains

Management - nature, characteristics. Functions of management-planning, organizing, influencing, controlling. Roles of marketing managers. Future of management-Tasks and challenges. Management process, opportunities, environment and external uncontrollable forces. Technological change and marketing. Trends in marketing environment, 4 p's of marketing mix. Customer demand. Consumer-buyer behaviour Market segmentation--basis, requisites for good segmentation. Market structure, conduct and market performance. Sales forecasting-role of forecasting, market potential, sales potential, steps in forecasting. Marketing planning-marketing strategies, branding, franchising, product positioning, packaging, labeling. Product development-product diversification, product cycle, market penetration. Product pricing – importance, role in marketing strategy. Social aspects of marketing-ecological aspects of marketing, ecomarks. Marketing of services-classification, service marketing model. Global marketing-scope, importance, challenges. Marketing strategies for agricultural commodities, estimation of demand supply for agricultural commodities.

III. MARKET REFORMS- AGRICULTURAL MARKETING LEGISLATION AND POLICIES

Salient features of Essential Commodities Act-Food Safety and Standards Act/Bill 2005, Consumer Protection Act 1986, Patent Act 2002, Monopolies and Restrictive Trade Practices Act/Competition Act 2002, Forward Markets Act 1953, Standards of Weights and Measures Act 1976, The Central Warehousing Corporation Act. Provisions of Karnataka State Agricultural Produce Marketing (Regulation) Act 1966/Karnataka Agricultural Marketing (Development Regulation) Act 2007. Regulation of Contract Farming Trade, Karnataka State Agricultural Marketing Board- Constitution and Functions. Agriculture Marketing Policies of the Government. Administered Price Policies - Commission for Agricultural Costs and Prices

(CACP) and its working. Policies of procurement, levy and public distribution system. Agri Export Zones (AEZs)/ Export Oriented Units (EOUs.)

IV. ENTRPRENERSHIP DEVELOPMENT AND AGRIBUSINESS PLAN

The concept of entrepreneur and entrepreneurship, objectives, introduction, writing business plans for high-tech agriculture, different phases of entrepreneurship development.

LIST OF PRACTICALS

1. Preparation of Business proposals for high tech agricultural enterprises and their economic evaluation and visiting Inspiring Agribusiness enterprises
2. Documenting and analyzing Government developmental schemes/programmes in vogue for their effectiveness
3. Assessing export potential for key high value agricultural commodities
4. Marketing channels of fertilizers and seeds and their demand estimation
5. Marketing channels for bio-pesticides and plant protection chemicals and their demand estimation
6. Marketing channels of labour and land and their demand estimation
7. Marketing channels of farm machinery and implements and Estimation of demand for farm machinery & implements
8. Identification of marketing channels and comparison of efficiency for agri inputs
9. Study of RaithaSanthe, contract farming and E- Choupals
10. Study of retail chain, direct marketing and commodity exchanges
11. Net marketing exercise and e- tendering

Name of Module	Course Number	Credit
FARM MECHANIZATIN DYNAMICS -I	PGDAM/FMD-001	3 (1+1+1)

Course Description:

This course is aimed at type of farm machinery and power sources, Tractor Driving and their control systems, Trouble shoots in tractor, Study of appropriate Agricultural Machinery, Field operation of tractor, Repair of agricultural machinery and use of plant protection equipment.

Learning Outcomes:

Upon successful completion of the modules, student will able to

- Drive the tractor with or without trailer
- Identify various farm equipment
- Do repair and maintenance of agricultural machinery
- Operate the tractor in field

AREAS OF COMPETENCY:

I. TRACTORS, THEIR CONTROL SYSTEMS AND MAINTENANCE
II. CLASSIFICATION OF FARM MACHINERY
III. FIELD OPERATION OF AGRICULTURAL MACHINERY AND THEIR MAINTENANCE

I. TRACTORS, THEIR CONTROL SYSTEMS AND MAINTENANCE

Classification of tractors. Various systems of agricultural tractor. Terminologies related to tractor. Power outputs of tractors. Trouble shoots in different systems of tractor. Care & scheduled maintenance of tractor. Concept of Engine fuels like Kerosene, Petrol, Diesel, Bio diesel and lubricants like Oil, Grease.

II. CLASSIFICATION OF FARM MACHINERY

Tillage equipment. Seed bed preparation equipment. Sowing &transplanting equipment. Puddling equipment. Inter-cultivation equipment. Plant protection equipment. Harvesting and threshing equipment. Baler and Forage chopping machines.

III. FIELD OPERATION OF AGRICULTURAL MACHINERY AND THEIR MAINTENANCE

Daily checks. Ballasting. Importance of PC and DC levers. Concept of slip, speed. Computation of field capacities and field efficiency of implement. Seed rates of various crops

and seed cum fertilizer drill calibrations. Data collections in harvesting and threshing equipment. Maintenance of Agricultural machinery and Plant Protection equipment.

LIST OF PRACTICALS

1. Demonstration of tractor cut model and study of plant layout through visit to tractor industry
2. Specification measurement of tractor
3. Driving of tractor with and without Trailer
4. Dismantling, assembling of agricultural machinery and specification checking
5. Attaching and detaching of implements with tractor
6. Field operation and performance evaluation of M. B Plough
7. Field operation and performance evaluation of Disc Plough
8. Field demonstration of Rotavator, Cultivator and Disc Harrow
9. Field demonstration of Bund former and Ridger
10. Visit to private agricultural machinery manufacturing industry

SEMESTER-II

Name of Module	Course Number	Credit
SOIL & WATER CONSERVATION DYNAMICS-II	PGDAM/SWC-002	3 (1+1+1)

Course Description

The Course is designed to increase the competence in areas of soil and water management, to ensure the scientific concepts for further application. To provide the technical aspects of handling the risks of management, such as climate changes, problematic soils, soil compaction, water quality etc, to analyze the rationale of climate knowledge in various field applications and to assess and use alternative knowledge systems in Conservation practices. Tillage- types and it's impact on soil, irrigation and drainage, soil management and environment, water quality and watershed management.

Learning Outcomes

Upon successful completion of this module, students will be able to:

- Assess the soil characteristics under a given tillage system
- Independently able to manage the problematic soils
- Assess the water quality and suggest suitable management practices
- Design a suitable watershed plan

AREAS OF COMPETENCY:

SOIL MANAGEMENT

I. TILLAGE AND RESIDUE MANAGEMENT
II. SOIL MANAGEMENT AND ENVIRONMENT
III. MANAGEMENT OF PROBLEMATIC SOILS

WATER MANAGEMENT

IV.IRRIGATION AND DRAINAGE
V.WATER QUALITY MANAGEMENT
VI.WATERSHED MANAGEMENT
VII. WATER MANAGEMENT FOR RAINFED AREAS

I.TILLAGE AND RESIDUE MANAGEMENT:

Tillage, objectives of tillage, types of tillage and effects of tillage on soil properties, Puddling and its objectives, Types of conservation tillage systems, Advantages of zero tillage and differ of soil characteristics between conservation tillage and high surface residue management system., Management of crop residues in different cropping system, Soil mulching and its role in moisture conservation. Study of soil hard pan, characters of hardpan and chiseling

II.SOIL MANAGEMENT AND ENVIRONMENT:

Study of submerged soils, study of NH3, NO2, CH4, CO2 emission and carbon sequestration, Study of soil air, its composition and factors affecting quality of soil air. Study of soil water and factors affecting quality of soil water

III.MANAGEMENT OF PROBLEMATIC SOILS:

Study of problematic soils, distribution, types and characteristics of problematic soils, physical limitations of acid, saline, sodic and waterlogged soils, study of constraints related to crop production in problematic soils, reclamation of problematic soils (physical, chemical and biological methods)

IV.IRRIGATION AND DRAINAGE

Water requirement for different crops, study of concept of irrigation, water use efficiency and field application efficiency, Study of critical stages of different crops for irrigation management, Study of different methods of irrigation, their characteristics and efficiency, Different methods of drainage, characteristics and efficiencies, Study of fertigation

V.WATER QUALITY MANAGEMENT:

Water quality management for agriculture use, health implications of drinking water containing nitrate-nitrogen above the drinking water standard, Harmful effects of contaminated water from drains and industrial effluents on crops and human health, Factors affecting eutrophication, Management of brackish water for irrigation

VI.WATERSHED MANAGEMENT

Concept and components of watershed management, Impact of watershed management on improving the productivity of dry land agriculture

VII.WATER MANAGEMENT FOR RAINFED AREAS

Dry land agriculture and its characteristics, Problems of dry farming in India, Measures to increase the efficiency of rain fed crop production, Conservation of soil moisture in dryland areas

LIST OF PRACTICALS

1. Soil health assessment and Indicators- Physical, chemical and biological

   a) Soil texture, bulk density, slaking, soil crusts, infiltration and available water capacity

   b) Soil pH, EC, reactive carbon, and soil nitrate

   c) Potentially mineralizable nitrogen, soil enzymes, earthworms and soil respiration

2. Estimation of moisture stress in the field and calculation of field capacity, permanent wilting point and water Use efficiency

3. Recognition of the influence of tillage practices common in Karnataka/India on erosion, soil structure, soil organic matter, compaction, crop productivity, and water quality

4. Identify and understand the following erosion control practices recommended a) conservation tillage, b) residue management, c) contouring, d) terracing, e) grass waterways, f) crop rotation, g) vegetative filter strips, and h) strip cropping.

5. Recognition of the components of an approved conservation plan and its relationship to crop management decisions.

6. Study on the efficiency of Furrow, Sprinkler, Drip/Trickle and Flooding irrigation

7. Study of fertigation and its importance

8. Natural Resources Information collection from database and analysis

9. Estimation of EC, SAR and RSC in the irrigation water and interpretations

10. Determination of Harmful effects of contaminated water from drains and industrial effluents on crops and human health indicators – Dissolved oxygen, bacterial contamination, BOD of contaminated water

Name of Module	Course Number	Credit
SOIL AND PLANT NUTRITION DYNAMICS-II	PGDAM/SND-002	3 (1+1+1)

Course Description:

The course focused at improving soil fertility and understanding the relationship of soil fertility with crop growth and development are essential in optimizing crop yield and protecting soil resources. Students will learn essential elements and interactions of these elements and how they influence yield. Students will also learn how to calculate rates for soil amendments and the potential impact of fertility practices on the environment. This course will expose students to deficiency symptoms observed in key and methods to correct nutrient deficiencies observed in these crops.

Learning outcome:

Students will be able to:

- Describe the process of preparing and applying green manure, animal/poultry waste, composting and synthetic fertilizers in production systems.
- Compare and contrast positive and negative attributes of all major fertilizer sources used in crop production.
- Describe the role of soil pH on nutrient availability and overall plant health.
- Describe the role of soil pH in nutrient availability for plant uptake and the soil properties that influence soil pH.
- Recognize nutrient deficiency and toxicity symptoms of all essential elements
- Determine the concentration of essential elements and forms of elements found in all available fertilizer and plan for nutrient management

AREAS OF COMPETENCY:

I. NUTRIENT SOURCES, ANALYSIS AND APPLICATION METHODS
II. SOIL pH AND LIMING
III. MANAGEMENT OF SODIC SOILS
IV. NUTRIENT MANAGEMENT PLANNING

I. NUTRIENT SOURCES, ANALYSIS AND APPLICATION METHODS

Plant nutrient sources: Commercial fertilizer, Soil minerals, Farmyard manure, Poultry manure, Vermi-compost, Bio-gas slurry, Urban/industrial waste, Press mud, Plant residue, Residual nutrients from fertilizers and manures, Bio-Fertilizers, Composts, Green manure and

green leaf manure, Phosphogypsum and Ash. Characteristics of the following types of fertilizers: Straight, Complex, Mixed, Liquid, Customized. Role and how to use the following in a nitrogen fertilization program: Urease inhibitors, Natural nitrification inhibitors Synthetic and nitrification inhibitors. Physical form and analysis of important major fertilizers. Physical form and analysis of the natural micronutrient fertilizers. Conversion fertilizer analysis of P and K from elemental to oxide form and vice versa. Commercial fertilizer terms: Total content, Fertilizer grade, Water soluble P content, Citrate soluble content, Available P content. Use fertilizer analysis information and soil test information to calculate fertilizer application rates. Use manure analysis information and soil test information to calculate manure application rates. Available nutrient from manure and the factors: Physical form, Source, Moisture content, State of decomposition, Method of application, Time of application, C:N ratio. Advantages and limitations of the following fertilizer placement methods: Surface broadcast, Broadcast incorporated, Band placement, Fertigation, Foliar application, Side dressing, Topdressing, Point placement, with seeds at seeding. Choice of fertilizer: Crop grown, Soil properties, Time of application, Method of application.

II. SOIL pH AND LIMING

Soil pH, buffering capacity, Active and potential acidity. Alkalinity, Acid forming factors, Acid equivalent of fertilizers, Electrical conductivity, Long term change in soil pH from applying fertilizers. Lime requirement, CEC, soil texture, and soil organic matter effect on lime requirements. pH and the availability of plant nutrients and heavy metals. Principle behind liming materials increases soil pH. Purity, fineness and Calcium Carbonate Equivalent (CCE) affect neutralizing ability of liming materials. Calculation of lime application rate to meet liming requirement.

III. MANAGEMENT OF PROBLAMATIC SOILS

Studying the character of saline soil, alkali soil, saline alkaline soil, calcareous soil and acidic soil. Reclamation of problematic soil: Source and management of water, drainage, Soil amendment, crop and cultivar selection, green manuring. Selection of the amendment, Determination of amendment requirement, Selection of the reclamant crop or cropping system. Fertilizer management for reclamant crops.

VI. NUTRIENT MANAGEMENT PLANNING

Setting of a targeted yield goal by using information about climate, production history, soil productivity, management level and most limiting factors. Use crop nutrient requirement, crop rotation/sequence, and soil test information to determine crop nutrient needs. Integrated Nutrient Management (INM)- Definition, Site Specific Nutrient Management, Fertilizer equivalents of organic sources, Organic farming. Importance of the following components of an economically and environmentally sound nutrients management plan: Maps of facilities, fields, and soils, environmentally sensitive area, cropping system, Targeted yields, Results of soil, plant, water and manure analysis, Nutrient budget for each field, Review and modification of plant as needed. N and /or P loss due to, Runoff, Volatilization, Leaching, De-nitrification. Manure storage, handling and application methods affect nutrient content and availability. Precision farming and their importance in nutrition management

LIST OF PRACTICALS

1. Determine the relative plant availability of nitrogen from the following organic sources and interpret the effect of the C/N ratio on nitrogen availability: a) legume crops, b) non-legume crops, c) manures, d) sludges, and e) by-products
2. Determination of primary (NPK) Secondary (Ca, Mg, S) and micro nutrients in different amendments (plant origin) on dry wet basis
3. Analysis, physical form, and handling precautions of each of the following nitrogen fertilizer materials and understand their effect on soil pH and nitrogen availability: a) anhydrous ammonia, b) urea, c) ammonium nitrate, d) UAN solutions, and e) ammonium sulfate.
4. Analysis, physical form, handling precautions and phosphorus availability of each of the following fertilizer phosphorus materials: a) Diammonium phosphate, b) Monoammonium phosphate, c) triple superphosphate, d) Single superphosphate and e) Ammonium polyphosphate
5. Analysis, physical form, handling precautions and potassium availability and relationship to chloride in soils of each of the following potassium fertilizer materials: a) potassium chloride, b) potassium sulfate, and c) potassium nitrate
6. Field study of pH- Influence on solubility and forms of nutrient.
7. Organic Fertility management of the soil- Practical’s to prepare traditional agricultural inputs
8. Compost heap maintenance and quality compost making

9. Preparation and application of Natural Liquid Fertilizers, Biofertiliers, and enriched compost.
10. Field Identification of soil and nutrient problems and designing Probable-Cause tree
11. Observation of leguminous plants, nodules preparing bioinoculum
12. Soil Organic matter determination in the field and Calculating agronomic efficiency of nutrients
13. Preparation of nutrient flow diagram of the field
14. Identify the plant parts to sample and the time to sample (calibrated plant growth stage) of major crops when determining the nutrient status of the crops by plant analysis Using Softwares, and other decision supporting devices for Nutrient management in the field. Eg. PLANET (Planning Land Applications of Nutrients for Efficiency and the environment), NuMASS-PDA
15. Synthesis of farming system models for efficient and economic nutrient use in Agriculture

Name of Module	Course Number	Credit
PLANT HEALTH DYNAMICS-II	PGDAM/PHD-002	3 (1+1+1)

Course Description

The course is aimed at familiarizing the students with the concepts of transgenic crops, bio control agents, pesticide resistance, bio pesticides, MRL, calibration of sprayers, drift losses, safety measures of pesticide handling, pesticide poisoning and antidotes, management strategies of key pests of certain major crops, pesticide toxicity and persistence of pesticides. This covers hands on and on field practical applications of pest management strategies with in depth coverage of pesticide safety and toxicology

Learning Outcomes

Upon successful completion of modules, students will be able to:

- Understand the concept of transgenic crops
- Carry out the calibration of sprayers
- Perform the pesticide toxicity and persistence studies
- Determine the management strategies of certain key pests

AREAS OF COMPETENCY:

I. PEST MANAGEMENT STRATEGIES
II. ENVIRONMENTAL STEWARDSHIP
III. HEALTH AND SAFETY
IV. MANAGEMENT STRATEGIES FOR KEY PESTS OF MAJOR CROPPING SYSTEMS

I.PEST MANAGEMENT STRATEGIES (Insects, diseases, nematodes, weeds etc.,)

Host plant resistance. Transgenic crops. Role of susceptible refuge host populations in managing insect resistance. Advantages and limitations of incorporating multiple traits into crops through transgenic techniques. Methods to minimize introducing pests into fields. Concept of critical weed free period. Concept of biological control. Identification of biological control agents. Advantages and limitations of using biological control agents in crop production. Bio-pesticides. Production practices that support conservation of natural enemies. Characteristics of pesticide affecting pesticide selection. Multiple and cross resistance. Factors affecting pesticide resistance. Management of pest resistance to herbicides, insecticides and fungicides. Contact and systemic pesticides. Characteristics of different pesticide formulations. Maximum residue level (MRL). Calibration of sprayer and calculation of pesticide concentration. Different types of equipment used for pesticide

application. Spray pattern of different nozzle. Factors increasing the risk of crop injury from pesticide. Factors effecting pesticide coverage. Management of spray drift. Identification of plant injury symptoms caused by different mode of action groups. Importance of different factors in applying herbicides to herbicide-resistance crops. Sources of information on banned and restricted pesticides. Toxicity and persistence of different pesticides

II. ENVIRONMENTAL STEWARDSHIP

Identification of information on pesticide label. Effect of pesticides on soil and water quality. Workers protection standards for handling pesticides. Effect of presence of endangered species or species on pesticide selection and application.

III. HEALTH AND SAFETY

Modes of pesticide entry into the human system. Chronic and acute pesticide poisoning. Recognize symptoms of acute pesticide poisoning. Possible chronic effects of pesticide poisoning. Procedure to follow if a pesticide gets on skin, eyes, mouth, or stomach, or is inhaled. Use of protective gears in mixing and applying pesticides. Procedure of cleaning for application equipment and protective gear. Proper procedure for disposing of pesticides and pesticides containers. Storage of pesticides. Procedure for handling a pesticide spill.

IV. MANAGEMENT STRATEGIES FOR KEY PESTS OF MAJOR CROPPING SYSTEMS

Program to manage pests of different crops under different agro-ecosystems. Impact of weather/climate on pests using abiotic factors for prediction of pest occurrence

LIST OF PRACTICALS

1. ET, EI and Action threshold level calculation for important pests in the field
2. Practicing cultural control of pests in selected crops
3. Identification of beneficial insects in the field
4. Culturing of Biological control insects in the lab and Production of Bio pesticide in the lab
5. Chemical Formulations for pest control and the methods of access (including databases)
6. Study of metabolic inhibitors stomach poisons in the field
7. Field usage of plant disease control chemicals

8. Calibration of sprayers(Knapsack, Tractor mounted and air carrier)
9. Identification and selection of spray patterns and nozzles types and Practicing drift reduction during pesticide application
10. Use of personal protective equipment and clothes
11. On field disposal methods of pesticide containers
12. Pesticide-survey in the market and Use of CPC(Crop Protection Compendium) database
13. Practicing IPM in the allotted field
14. Preparation of business proposal on some of the viable good IPM practices, product development for agribusiness

Name of Module	Course Number	Credit
SUSTAINABLE CROP PRODUCTION DYNAMICS-II	PGDAM/SCP-002	3 (1+1+1)

Course Description:

The course focused at familiarizing the students with the concepts of precision agriculture, agronomic innovations/technologies and management practices, harvesting and post harvesting practices/technologies, managing risk and un-certainty.

Learning Outcomes:

Upon the completion of course module, the student will be able to:

- Learn an precision agriculture methods
- Identify the agronomic innovations and technologies for commercialization
- Learn improved methods of harvesting and post harvesting
- Understand risk mitigating measures

AREAS OF COMPETENCY:

I. APPLIED TECHNOLOGIES
II. HARVEST AND STORAGE
III. MANAGING RISK IN CROP PRODUCTION

I.APPLIED TECHNOLOGIES

Precision agriculture terms. Factors affecting yield variability in field and horticultural crops. Concept on Land-use map. Location of field site with the help of GPS unit.

II.HARVEST AND STORAGE

Factors influencing harvesting. Factors influencing crop/grain quality in storage. Maintenance of varietal purity of crop at planting, harvest, delivery and storage

III.MANAGING RISK IN CROP PRODUCTION

Management of production risk. Factors effecting crop management decisions

LIST OF PRACTICALS

1. Preparation of Land use map of the farm allotted- Reading of Land use maps of existing sources
2. Global Positioning systems and it's utility at the farm- Using of Hand help GPS
3. GIS/VRT/ Remote sensing data acquisition and interpretation for the farm allotted
4. Database based study of agro climatic zones of India
5. Indices for evaluation of cropping systems like land utilization index, cropping intensity, etc
6. Preparation of cropping system for different farming situations having varying resource availability- Contract farming and cooperative Farming
7. Preparation of cropping system for different farming situations having varying resource availability- Corporate Farming, Traditional Farming
8. Preparation of cropping system for different farming situations having varying resource availability- Organic Farming
9. Estimation of interactions of land, water, nutrient, labour and capital using mathematical tools
10. Preparation of farming system models with intentional integration of components for profit, for better recycling for round the year production/ income/ employment
11. Case study of intentional integrated farming systems for resource and nutrient dynamics
12. Studying the impact of Mechanization of selected Agricultural practices/ Intercultural operations
13. Potential for post-harvest jam, juice, pickles, value addition to cereals, pulses etc
14. Estimation of interactions of land, water, nutrient, labour and capital in the allotted field using mathematical tools
15. Documentation of case studies from farmers field

Name of Module	Course Number	Credit
AGRIBUSINESS MARKET DYNAMICS & ENTRPRENEURSHIP DEVELOPMENT-II	PGDAM/AMD-002	3 (1+1+1)

Course Description:

Agricultural input marketing, value chain in agricultural marketing, Direct marketing through Farmers Market, strategies for inputs and output marketing, market led extension, market information systems, time series analysis of data for forecasting demand supply and price and entrepreneurship development

Learning Outcomes:

Upon successful completion of course modules, students will be able to:

1. Estimate demand for farm inputs and analyze market channels and price spread and value chain
2. Market Survey, analysis of information, market strategies and product development, different formats of marketing, e-marketing
3. Understanding Institutional support to business entrepreneurs
4. Institutional Interventions and Capacity building for Agri Business Entrepreneurship

AREAS OF COMPETENCY:

I. AGRICULTURAL INPUT MARKETING
II. VALUE CHAIN IN AGRIUCLTURAL MARKETING
III. AGRICULTURAL PRICE ANALYSIS
IV. MARKET INFORMATION SYSTEM AND FUTURES TRADING
V. ENTRPRENERSHIP DEVELOMENT AGRIBUSINESS PLANS

I. AGRICULTURAL INPUT MARKETING

Importance, scope and characteristics of input marketing. Derived demand. Input Marketing V/s Output marketing. Input demand and commercial agriculture. Seed marketing-Importance, supply of seeds, agencies involved in marketing channels of distribution, MNC's marketing strategies. Government agencies-KSSC, NSC. Government policy on seed marketing. Fertilizer marketing-importance, consumption, regional disparity in consumption, demand and supply for fertilizers. Agencies involved in fertilizer Marketing-Public, Private, Co-operative sectors. Channels of marketing. Partial decontrol. Pricing policies and subsidies Marketing of agricultural credit products. Farm machinery and implements marketing - agencies in marketing. Demand and Supply-market share. Plant protection chemicals-importance, crop wise utilization, size of Indian pesticide market. Demand and supply of

pesticides. Agencies in marketing. Channels of marketing. Market share. Land market reforms tenancy. Labour markets dynamics, heterogeneity, wage diffentials-skill differentials. Emergence of groundwater markets-rationale, pricing and costing of groundwater. Energy-demand and supply, pricing and distribution policies. IT applications in agri- input marketing. E marketing. Role of IT in decision support system private information shops/kiosks-emergence of agri-web-portals. Emerging IT needs in agri-input marketing. Study of Agro-Service Centers, market-led extension

II. VALUE CHAIN IN AGRIUCLTURAL MARKETING

Meaning of value and value chain. Concept of value chain. Components of value chain-Grading, Processing, Storage, Transportation, Packaging and Delivery. Value chain from farm gate to consumer's plate. Processing-meaning and functions, processing of important commodities like food grains, oilseeds, commercial and horticultural crops. Economics of processing. Economics of storage. Transportation-meaning and functions. Economics of transportation. Packaging-meaning and functions. Economics of packaging. Special requisites for marketing of livestock and its products-process, storage, transportation and packaging. Economics of marketing of livestock and its products.

III. AGRICULTURAL PRICE ANALYSIS

Meaning and concept of agricultural prices. Functions and importance of prices. Market prices and administered prices. Sources of price statistics. Pricing under different markets-role of demand and supply. Estimation of demand for and Supply of agricultural commodities. Elasticities of demand and supply. Temporal and spatial fluctuations in agricultural prices: types and their causes. Analysis of price movements: estimation of trend, seasonal, cyclical and irregular movements in prices over time. Inflation and general price level. Price stabilization measures. Agricultural price index numbers: wholesale price index and consumer price index. Types, construction and uses of index numbers. Price forecasting.

VI. MARKET INFORMATION SYSTEM AND FUTURES TRADING

Importance of market information and market intelligence in marketing of agricultural commodities. Source and means of collection of data. Compilation, analysis and dissemination of market information and intelligence in India. Deficiencies, problems, reliability of market information, remedial measures. E-trading, e-choupals, websites and IT tools for marketing. Futures trading- meaning and features. Differences between spot and

futures markets. Commodities covered under futures trading. Options, derivatives and functionaries. Speculation, hedging and risk management mechanisms of commodity in futures trading. Institutions involved in futures trading –NCDEX, MCDEX, MCX. Study of export procedures for Agro-based products

VI. ENTRPRENERSHIP DEVELOMENT AGRIBUSINESS PLANS

Phases of Entrepreneurial Development Programme, Institutional support to business entrepreneurs, Institutional Interventions and Capacity building for Agri Business Entrepreneurship, Writing the Agri-business plan

LIST OF PRACTICALS

1. Estimation of marketed and marketable surplus and returns to storage
2. Estimation of marketing costs, margins and price spread
3. Study of economics of processing, value addition, storage and transportation of food grains and other commodities
4. Preparation of business proposal on viable good IPM practices/innovations
5. Collection of data on arrivals and prices of agricultural produce from APMCs
6. Computation of Moving averages, trend, Seasonal, Cyclical and irregular variations and fluctuations of a selected Agri commodity
7. Construction of simple index numbers for prices, weighted index numbers, Laspeyre's index, Paasche's index and Irwin Fisher's index and consumer price index
8. Study of farm harvest prices, wholesale prices and administered prices for agricultural produce.
9. Mapping value chain for key farm products
10. Evaluating custom hiring centre for agricultural implements and machineries/irrigation technologies

Visits will be linked with the Practical mentioned above.

Visit to APEDA, NSC, KSSC, HOPCOMS, Regulated Markets, Agricultural Produce Co-operative Marketing, Commodity Exchange Board/broker, IT Park and Agri Export Zones (AEZ's), Agro-Service Centres

Name of Module	Course Number	Credit
FARM MECHANIZATION DYNAMICS-II	PGDAM/FMD-002	3 (1+1+1)

Course Description:

This course is aimed at irrigation and irrigation equipment, latest technologies in agricultural engineering, renewable energy sources and food grains and post-harvest operations.

Learning Outcomes:

Upon successful completion of the modules, student will able to

- Establish custom hiring center
- Identify irrigation equipment like Drip, sprinklers Motors, pumps etc.
- Know GPS, remote sensing and sensors
- Use and harness the renewable energy sources
- Identify food grains

AREAS OF COMPETENCY:

I. FARM MECHANIZATION AND FARM MACHINERY MANAGEMENT
II. IRRIGATION ENGINEERING
III. PRECISION AGRICULTURE / INFORMATION TECHNOLOGY IN AGRICULTURE
IV. RENEWABLE ENERGY SOURCES AND THEIR APPLICATIONS
V. POST HARVEST TECHNOLOGY

I. FARM MECHANIZATION AND FARM MACHINERY MANAGEMENT

Farm mechanization. Role of farm mechanizations. Selection of tractor and matching implement for agricultural work. Concept and Establishment of custom hiring center. Break-even analysis for selection of Agricultural machinery.

II. IRRIGATION ENGINEERING

Concept of Irrigation. Classification of Irrigation methods. Irrigation Pumps and Electric motors. Sprinkler, Drip Irrigation and their components. Design concept of Drip and Sprinkler irrigation.

III. PRECISION AGRICULTURE / INFORMATION TECHNOLOGY IN AGRICULTURE

Concept of Precision Agriculture. Application of Remote sensing, Sensors, Drones, Robotics and Modern Tractors in agriculture.

VI. RENEWABLE ENERGY SOURCES AND THEIR APPLICATIONS

Classification of Renewable Energy Sources. Application of Renewable Energy Sources like Solar lighting, Solar water heating, Solar Dryer, Solar fencing, Wind mill, Bio gas and Bio mass briquetting.

V. POST HARVEST TECHNOLOGY

Grains and their properties. Post-harvest operations of food grains. Post-harvest equipment like Cleaner, Grader, Sorter, Winnower, Bagging and Packaging machines.

LIST OF PRACTICALS

1. Calibration of Seed-cum fertilizer drill for different crops
2. Practical on Puddling operation
3. Field demonstration of Seed-cum fertilizer drill/Transplanters
4. Field demonstration of Power weeder, Hand weeders and Dry land/wetland weeder
5. Field demonstration of plant protection equipment
6. Field demonstration of Reaper
7. Field demonstration of Thresher
8. Demonstration of Irrigation Equipment
9. Demonstration of Solar Pumping system, Solar grid and Biogas production plant through visit to UAS, GKVK, Bengaluru
10. Demonstration of Seed processing equipment through visit to private industries
11. Demonstration of food processing equipment through visit to private industries

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