

Course Curriculum



B.Sc. (Hons.) Agribusiness

Sri Sri University

Sri SriVihar, Bidyadarpur Arilo, Ward No. 3, Cuttack 754 006, Odisha

The course curriculum is interdisciplinary with agriculture, economics and management disciplines topics organized in balance to provide insights on theoretical and practical topics. And also to train the students to accumulate skills to pursue career in agribusiness.

Program outcome: Promotes student centric mentoring and imparting basic concepts and technical knowledge on various disciplines in agriculture, horticulture with balanced exposure the theory and practices in agribusiness management. students are also exposed to rural agriculture work experience and experiential learning with internship in industries. Besides, yogic sciences, human values and ethics and spiritualism. Students after completion of the program should be able to i) Comprehend the interdisciplinary science of agriculture, horticulture, business management and allied scientific knowledge required to increase the income of farmers; ii) Comprehensively gain the knowledge on status of agriculture in India and income generating enterprises associated with farming activities; iii) Develop innovative business models and skill to become an entrepreneur; iv) Create innovative business models and profitable enterprises to market agricultural produce.

B.Sc. (Hons.) Agri-business is professional course with intensive training in inter-disciplinary courses and experiential learning modules. The undergraduates will have wide array of job opportunities in agricultural sectors, which include; Agri-business companies, Agro-retailing companies. Agri-machinery and equipment companies, Fertilizer/Seed production companies, Food processing companies, Plantation management groups, Practicing progressive agriculturists, Education and research organization, Social enterprise and NGOs.

Besides, higher education in the domain can pave way for various job avenues viz., Farm or Plantation Manager, Agricultural Research Scientist, Agriculture Development Officers, Agriculture Consultant, Business Development Executive, Marketing Executive, Subject matter specialist in professional colleges and universities, Technical advisor in NGOs, Agricultural innovators and entrepreneurs.

1. Agricultural Sciences

Course Code	Course Title	Credits
CPK 101	Crop production technology- Field Crops- I (Kharif)	2 (1+1)
CPR 102	Crop production technology- Field Crops- II (Rabi)	2 (1+1)
IWM 204	Irrigation Water Management	2 (1+1)
FSA 203	Modern Farming Systems and Sustainable Agriculture	2 (1+1)
PMF- 101	Production Management of Important Fruit Crops	2 (1+1)
PAM 102	Production Management of Vegetable, Floricultural, Aromatic and Medicinal Crops	3 (2+1)
PHT 203	Post-Harvest Technology of Horticultural Crops	2 (1+1)
PPB 102	Principles of Plant Biotechnology	2 (1+1)
ENS 301	Environmental Studies and Disaster Management	3 (2+1)
SAC 101	Fundamentals of Soil Science	2 (1+1)
SAC 102	Soil, Water and Plant analysis	2 (1+1)
SFF 203	Soil Fertility, Fertilizers and Nutrient Management	2 (1+1)
LPM 101	Livestock and poultry management	2 (1+1)
VAP 102	Value Addition in Animal Products	2 (1+1)
FST 102	Farm Structure and Protected Environment technologies	2 (1+1)
PAT 203	Post-Harvest Technology of Agricultural Crops	2 (1+1)
FPM 204	Farm Machinery and Power	2 (1+1)
FCP 102	Fundamentals of Crop Protection	3 (2+1)
IPM 305	Integrated Pest Management	2 (1+1)

IDM 306	Integrated Disease Management	2 (1+1)
CSP 203	Communication Skills & Personality Development	2 (1+1)
CPB 204	Consumers Psychology in Business Management	2 (1+1)
EDB 306	Entrepreneurship Development and Business Management	2 (1+1)
ICT 101	Information and Communication Technology	2 (1+1)
SMB 204	Statistical Methods in Business	3 (1+2)
ENG 101	Comprehension and Communication Skills in English	2 (1+1)
ARP 305	Agriculture and Rural Development Programs of India	1 (1+0)
CPT 306	Commercial Seed Production Technology	1 (1+0)
IPR 203	Intellectual Property Rights	1 (1+0)
BSE 204	Bio-safety and Bio-ethics	1 (1+0)

2. Agricultural Economics

Course Code	Course Title	Credits
NRE 101	Agricultural and Natural Resource Economics	3 (2+1)
BIT 102	Banking and International Trade	3 (2+1)
PET 203	Principles of Economic Theory	3 (2+1)
ACM 204	Agricultural Co-operation, Institutions and Management	3 (2+1)
DIA 305	Dynamics of Indian Agriculture	3 (2+1)
FME 305	Farm Management and Production Economics	3 (2+1)
FMA306	Financial Management and Insurance in Agribusiness	3 (2+1)

3. Agricultural Marketing

Course Code	Course Title	Credits
IAM 102	Introduction to Agricultural marketing	2 (1+1)
MIO 102	Marketing Institutions and Organizations	2 (1+1)
PMM 203	Principles of Marketing Management	3 (2+1)
MTA 203	Market and Trade Acts	2 (1+1)
RMI 204	Rural Marketing and Market Infrastructure	2 (1+1)
IMM 204	Input Marketing Management	2 (1+1)
PPM 305	Product Promotion Methods	2 (1+1)
TAC 305	Trading of Agricultural Commodity-I	2 (1+1)
TAC 306	Trading of Agricultural Commodity-II	2 (1+1)
CMM 306	Commodity Markets	2 (1+1)
CDM 604	e-Commerce and Digital Marketing	2 (1+1)

4. Agribusiness

Course Code	Course Title	Credits
ABM 101	Principles of Agribusiness and Management	2 (1+1)
AIN 102	Agro-based Enterprises and Industrialization	2 (1+1)
AGI 203	Agri. Informatics	2 (1+1)
HRD 203	Human Resource Management and development	3 (2+1)
OPA 204	Office Procedures for Agribusiness	2 (1+1)
OBB 204	Organizational Behaviour for Business Management	2 (0+2)
SBM 305	Strategic Business Management	2 (1+1)
PPC 305	Production Management, Planning and Control	2 (1+1)

IRM 305	Inventory of Risk Management	2 (1+1)
APM 305	Agro-processing Management	2 (1+1)
MAC 306	Managerial Accounting	2 (1+1)
MSP 306	Market Survey and Price Analysis	2 (0+2)
SCM 306	Supply Chain Management	2 (1+1)

5. Remedial and Non-Gradial Courses

Course Code	Course Title	Credits
Remedial		
EMT 101	Elementary Mathematics	2 (2+0)
IBL 101	Introductory Biology	2 (1+1)
	Total Credits	4 (3+1)
Non-Gradial Courses		
HME 101	Human Values and Ethics	1 (1+0)
PYE 101	Physical Education and Yoga Practices	1 (1+0)

6. Elective Courses

Course code	Course Title	Credits
VCA 401	Value Chain in Agriculture	3 (1+2)
RAB 402	Recent Advances in Banking	3 (2+1)
PBP 403	Planning, Formulation and Evaluation of Business Projects	3 (1+2)
HTH 405	High-tech Horticulture	3 (1+2)
ATM 501	Agro-tourism	3 (1+2)
FTP 502	Food Technology and Processing Management	3 (2+1)
FSS 503	Food safety and standards	3 (2+1)
EIM 601	Export Import Management	3 (1+2)
RMT 602	Retail Management	3 (1+2)
ABB 603	Agrochemicals, Biopesticides & Biofertilizers	3 (2+1)

7. Experiential Learning Program

Module No.	Module Code	Course Title	Credits
I		Production Management of vegetable crops	0+10=10
	ELM-PMV	Marketing Management of vegetable crops	0+10=10
	ELM-MKV		
II	ELM-PMF	Production Management of floriculture crops	0+10=10
	ELM-MKF	Marketing Management of floriculture crops	0+10=10
III	ELM-PMO	Production Management of oilseed crops	0+10=10
	ELM-MKO	Marketing Management of oilseed crops	0+10=10
IV		Production Management of pulse crops	

	ELM-PMP ELM-MKP	Marketing Management of pulse crops	0+10=10 0+10=10
V	ELM-PMD ELM-MKD	Production Management of Dairy Enterprises Marketing Management of Dairy Enterprises	0+10=10 0+10=10
VI	ELM-PMC ELM-MKC	Production Management of Poultry Enterprises Marketing Management of Poultry Enterprises	0+10=10 0+10=10
VII	ELM-ACV ELM-MKV	Value Additions in Major Agricultural Commodity Marketing of Value Added Products	0+10=10 0+10=10
		Any 2-modules (from the same set)	20 (0+20)

8. Agro-industry Attachment (AIA)

		Internship	Credits
1	Agro-Industry Internship		20 (0+20)
Total credits			20 (0+20)

9. Study tour

Course Code	Educational Tour	Credits
EST 301	Study tour – I State- Agricultural Institutions, Research organization, Universities, ICAR Research centers	1 (0+1)
EST 401 II	Study tour – II Outside the state- Agricultural Institutions, Research organization, Universities, ICAR Research centers	2 (0+2)
Total credits		3 (0+3)

Semester I

Course code	Course Title	Credits
PMF 101	Production and Management of Important Fruit Crops	2 (1+1)
AGR 101	Crop Production Technology- I (Kharif crops)	2 (1+1)
ABM 101	Principles of Agribusiness and Management	2 (1+1)
SAC 101	Fundamentals of Soil Science	2 (1+1)
LPM 101	Livestock and Poultry Management	2 (1+1)
NRE 101	Agricultural and Natural Resource Economics	3 (2+1)
ICT 101	Information and Communication Technology	2 (1+1)
ENG 101	Comprehension and Communication Skills in English	2 (1+1)
HME 101	Human Values and Ethics	1 (1+0)
PEY 101	Physical Education and Yoga Practices	1 (0+1)
GDS 101	Good Governance and Democratic Society	1 (1+0)
EMT 101	Elementary Mathematics	2 (2+0)
IBL 101	Introductory Biology	2 (1+1)
Total credits		24 (14+10)

Semester II

Course code	Course Title	Credits
AGR 102	Crop Production Technology- II (Rabi crops)	2 (1+1)
VFM-102	Production Management of Vegetable, Floricultural, Aromatic and Medicinal Crops	3 (2+1)
PPB 102	Principles of Plant Biotechnology	2 (1+1)
SWP 102	Soil, Water and Plant Analysis	2 (1+1)
VAP 102	Value Addition in Animal Products	2 (1+1)
FST 102	Farm Structure and Protected Environment Technologies	2 (1+1)
FCP 102	Fundamentals of Crop Protection	3 (2+1)
BIT 102	Banking and International Trade	3 (2+1)
IAM 102	Introduction to Agricultural Marketing	2 (1+1)
MIO 102	Marketing Institutions and Organizations	2 (1+1)
AIN 102	Agro-based Enterprises and Industrialization	2 (1+1)
Total credits		25 (14+11)

Semester III

Course code	Course Title	Credits
FSA 203	Modern Farming Systems and Sustainable Agriculture	2 (1+1)
PHT 203	Post-Harvest Technology of Horticultural Crops	2 (1+1)
SFF 203	Soil Fertility, Fertilizers and Nutrient Management	2 (1+1)
FPP 203	Fundamentals of Plant Pathology	2 (1+1)
PAT 203	Post-Harvest Technology of Agricultural Crops	2 (1+1)
CSP 203	Communication Skills and Personality Development	2 (1+1)
PET 203	Principles of Economic Theory	3 (2+1)
PMM 203	Principles of Marketing Management	2 (1+1)
MTA 203	Market and Trade Acts	2 (2+0)
HRD 203	Human Resource Management and Development	3 (2+1)

AGI 203	Agri-Informatics	2 (1+1)
IPR 203	Intellectual Property Rights	1 (1+0)
	Total credits	25 (14+10)

Semester IV

Course code	Course Title	Credits
IWM 204	Irrigation Water Management	2 (1+1)
FPM 204	Farm Machinery and Power	2 (1+1)
SMB 204	Statistical Methods in Business	3 (1+2)
CPB 204	Consumers Psychology in Business Management	2 (1+1)
ACM 204	Agricultural Cooperation, Institutions and Management	3 (2+1)
RMI 204	Rural Marketing and Market Infrastructure	3 (2+1)
IMM 204	Input Marketing Management	2 (1+1)
OPA 204	Office Procedures for Agribusiness	1 (0+1)
OBB 204	Organizational Behaviour of Business Management	2 (2+0)
BSE 204	Bio-safety and Bio-ethics	1 (1+0)
	Elective Course	3 (2+1)
	Total credits	23 (13+10)

Semester V

Course code	Course Title	Credits
IPM 305	Integrated Pest Management	2 (1+1)
DIA 305	Dynamics of Indian Agriculture	3 (2+1)
FME 305	Farm Management & Production Economics	3 (2+1)
PPM 305	Product Promotion Methods	2 (1+1)
TAC 305	Trading of Agricultural Commodity-I	2 (1+1)
SBM 305	Strategic Business Management	2 (1+1)
PPC 305	Production Management, Planning and Control	2 (1+1)
IRM 305	Inventory and Risk Management	2 (1+1)
APM 305	Agro-Processing Management	2 (1+1)
ARP 305	Agriculture and Rural Development Programs of India	1 (1+0)
	Elective Course	3 (2+1)
	Total credits	24 (13+10)

Semester VI

Course code	Course Title	Credits
IDM 306	Integrated Disease Management	2 (1+1)
FMA 306	Financial Management in Agri-Business	3 (2+1)
TAC 306	Trading of Agricultural Commodity-II	2 (1+1)
CMM 306	Commodity Market	2 (1+1)
MAC 306	Managerial Accounting	2 (1+1)
MSP 306	Market Survey and Price Analysis	2 (0+2)
SCM 306	Supply Chain Management	2 (1+1)
ENS 306	Environmental Studies and Disaster Management	3 (2+1)
EDB 306	Entrepreneurship Development and Business Management	2 (1+1)
CDM 604	e-Commerce and Digital Marketing	2 (1+1)

CPT 306	Commercial Seed Production Technology	1 (1+0)
	Elective Course	3 (2+1)
	Total credits	26 (14+12)

Semester VII

Rural Agricultural Work Experience-I (RAWE)

Course code	Course Title	Credits
RWE 407	Student Ready – Placement in Villages	10 (0+10)
RWE 407	Student Ready – Placement in Industries	10 (0+10)

Activities	No. of weeks	Credit hours
General orientation and campus training by discipline-wise faculty members	1	14
Village attachment	8	
Attachment in Univ./KVK/Research Institutions etc.	5	
Agri. Clinic	2	02
Agro-industrial attachment	3	03
Project report preparation, presentation and evaluation	1	01
Total weeks for RAWE and AIA	20	20

Modules for development of entrepreneurship: A student has to register 20 credits from same package of modules of (0+10) as indicated below;

Course code	Title of the module	Credits
I-ELM- PMV 401	Production Management of vegetable crops	10 (0+10)
I-ELM-MKV402	Marketing Management of vegetable crops	10 (0+10)
II-ELM-PMF 403	Production Management of floriculture crops	10 (0+10)
II-ELM- MKF 404	Marketing Management of floriculture crops	10 (0+10)
III-ELM- PMO 405	Production Management of oilseed crops	10 (0+10)
III-ELM- MKO406	Marketing Management of oilseed crops	10 (0+10)
IV-ELM- PMP 407	Production Management of pulse crops	10 (0+10)
IV-ELM- 408-MKP	Marketing Management of pulse crops	10 (0+10)
V-ELM-PMD 409	Production Management of Dairy Enterprises	10 (0+10)
V-ELM- -MKD 410	Marketing Management of Dairy Enterprises	10 (0+10)
VI-ELM- PMC 411	Production Management of Poultry Enterprises	10 (0+10)
VI-ELM- MKC 412	Marketing Management of Poultry Enterprises	10 (0+10)
VII-ELM- AVM 413	Value Additions in Major Agricultural Commodities	10 (0+10)
VII-ELM-MKV 415	Marketing of Value Added Products	10 (0+10)

Semester VIII

Rural Agricultural Work Experience-II (RAWE)

Agro-Industry Attachment (AIA): Modules for Experiential Learning Program include Hands on Training (HOT), student has to register 20 credits from any of the modules of (0+10) total of 20 credits.

Activities and tasks during the agro-industrial attachment program include- Acquaintance with industry and staff, study of structure, functioning, objective and mandates of the industry, study of various processing units and hands-on training under the supervision of industry staff, ethics industry, employment generated by the industry, contribution of the industry promoting environment, learning business network including outlets of the industry, skill development in all critical tasks of the industry, documentation of the activities and task performed by the students, performance evaluation, appraisal, and ranking of students.

Course code	Title of the module	Credits
EBB 408	Production Technology for Bioagents and Biofertilizers	10 (0+10)
ESP 408	Seed Production and Technology	10 (0+10)
EMC 408	Mushroom Cultivation Technology	10 (0+10)
ESP 408	Soil, Plant, Water and Seed Testing	10 (0+10)
ECB 408	Commercial Beekeeping	10 (0+10)
EPP 408	Poultry Production Technology	10 (0+10)
ECH 408	Commercial Horticulture	10 (0+10)
EFL 408	Floriculture and Landscaping	10 (0+10)
EFV 408	Food Processing and value addition	10 (0+10)
EAW 408	Agriculture Waste Management	10 (0+10)
EOP 408	Organic Production Technology	10 (0+10)
EHH 408	Hi-Tech Horticulture	10 (0+10)
EBF 408	Agricultural cooperative banking and finance	10 (0+10)
ECK 408	Agri-clinics, KVK and Service Centre's	10 (0+10)

Note: In addition to above ELP modules other important modules may be given to the students

Evaluation of Experiential Learning Program/HOT

Parameters	Max. Marks
Project Planning and Writing	10
Presentation	10
Regularity	10
Monthly Assessment	10
Output delivery	10
Technical Skill Development	10
Entrepreneurship Skills	10
Business networking skills	10
Report Writing Skills	10
Final Presentation	10
Total	100

Note: In addition to above ELP modules other important modules may be given to the students.

Discipline-wise summary of courses

	Discipline	Total Credits
1	Agronomy	8
2	Horticulture	7
3	Plant sciences- Genetics and Plant Breeding, seed technology	6
4	Soil Science and Agricultural Chemistry	6
5	Animal Science and Dairy Science	4
6	Agricultural Engineering	6
7	Plant Protection (Plant Pathology and Entomology)	7
8	Agricultural Extension	7
9	Computer Science	2
10	Statistics	3
11	Agricultural Economics	21
12	Agricultural Marketing	21
13	Agribusiness	29
14	Experiential learning	40
	Total	167
16	Electives	9
17	Remedial	4
18	Non-gradual	2
	Grand Total	182

AGR 101 Crop Production Technology- I (Kharif crops) 2 (1+1)

Objective: Provide basic knowledge about production of kharif crops.

Course outcome: Upon completion of the course students will be able to;

- List the Kharif crops and Know about the morphological characters of various kharif crops.
- Explain about soil and climatic requirements of different kharif crops.
- Explain the cultural practices associated with various kharif crops and their morphology.
- Identify the yield contributing characters and calculation of yield.

Theory

Importance of agricultural meteorology – weather and climatic factors affecting crops. Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield of kharif crops. Cereals : Rice, maize, kharif sorghum, pearl millet and minor millets Pulses: Pigeonpea, mungbean, uridbean, horsegram, mothbean, cowpea Oilseeds : Groundnut, sesame, soybean, castor and niger; Fibre crops : Cotton, jute, sunhemp and dhaincha Forage crops : Sorghum, pearl millet, maize, cowpea, cluster bean, rainfed and irrigated grasses

Practical:

Introduction to agro-meteorological instruments. Rice nursery preparation and transplanting/seed bed preparation and sowing of Kharif crops; Calculations of seed rate; Sowing of soybean, pigeonpea, mungbean, maize, groundnut, and cotton; Effect of seed size on germination and seedling vigour of soybean/groundnut; Effect of sowing depth on germination of soybean; Identification of weeds in rice, maize and soybean fields and study of weed control experiments in these crops; Top dressing of nitrogen in maize and rice and study of fertilizer experiments on rice, maize, sorghum and millets; Study of yield contributing characters, yield calculations, harvesting and yield estimation of above crops; Study of crop varieties and important agronomic experiments; Study of forage experiments.

Suggested readings:

Hand book of Agriculture, ICAR Publication, 6th edition, 2006.
Chhida Singh, Prem Singh and Rajbir Singh Modern Techniques of raising field crops, 2nd edition
Rajendra Prasad Field Crops
Reddy SR, Principles of Agronomy, Kalyani Publishers Third edition
S.S. Cheema, B.K. Dhaliwal and T.S. Sahota Theory and Digest Agronomy
M.M. Hosmani, B.M. Chittarpur and H.B. Babalad. Farm Productivity New Century New Challenges
V.G. Vaidya, K.R. Sahasrabudde and V.S. Khuspe, Crop production and field experimentation Continental Prakashan, Pune.

SAC 101 Fundamentals of Soil Science 2 (1+1)

Objective: To acquaint with soil forming process, its properties- physical, chemical and biological, as a plant growth medium.

Course outcome: Upon completion of the course students will be able to;

- Explain the soil forming process to relate to the soil forming factors in various climatic conditions.
- List the physical properties and chemical properties that affect both plant growth and biological activity
- Explain soil as medium of plant, soil quality and soil health in relation to plant growth.

Theory

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids inorganic and organic;

silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and microorganisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Study of soil map. Determination of soil colour. Demonstration of heat transfer in soil. Estimation of organic matter content of soil.

Suggested Reading

Indian Society of Soil Science. (2012). Fundamentals of Soil Science, IARI, New Delhi.
Das, D. K. (2015). Introductory Soil Science, 4th Edition, Kalyani Publishers, New Delhi
Sehgal, J. (2015). A Text Book of Pedology – Concepts and Applications, Kalyani Publishers, New Delhi.
N. C. Brady Nature and properties of soils (Tenth edition), prentice Hall of India Pvt. Ltd. New Delhi.
V.D. Patil & C.V. Mali Fundamentals of Soil Science – A Text Book
Fundamentals of Soil Science by ISSS, New Delhi.

PMF 101 Production Management of Important Fruit Crops 2 (1+1)

Objective: Provide insights on basic theory, concepts and practices involved in production practices of tropical and subtropical fruit crops.

Course outcome: Upon completion of the course students will be able to;

- Explain the several practices involved in cultivation and management of different tropical and subtropical fruit crops.
- Identify different seeds of tropical and subtropical fruit crops with their plant types in their natural existence.
- Classify different tropical and subtropical fruit crops according to their agro-climatic requirement, physiological and morphological features.
- Practice techniques involved in management of different tropical and subtropical fruit crops.

Theory

Classification of fruit crops on horticultural basis. Importance, present status and future scope` for fruit growing in Odisha and India. Area and production, export, import scenario of fruit crops and plantation crops in Odisha and India. Nutritive value of fruits, importance of selection of site, fencing, planting systems, high density planting, wind breaks and shelter belts in fruit production. Propagation methods and use of rootstocks, methods of training and pruning. Special horticultural practices ringing, girdling, bending, notching, etc. Nutrient management, water management, weed control, mulching, intercropping, use of growth regulators in fruit production, physiological disorders in fruit crops. Package of practices for cultivation of major fruit crops like, mango, banana, citrus, grape, papaya, sapota, guava, pomegranate, minor fruit crops like ber, fig, coconut, arecanut, etc. Industrial value of plantation crops (Give brief cultivation information in tabular form for minor crops).

Practical:

Study of garden tools and implements. Study of propagation media, containers, potting mixture, potting, repotting and transplanting. Nursery practices for raising seedlings. Identification of fruit and plantation crops. Plant propagation by seed, cutting, layering, budding and grafting. Practices in planning (layout) and planting systems of fruit crops. Training and pruning, manures and fertilizers application, irrigation methods. Special horticultural practices ringing, girdling, bending, notching etc. Preparation and application of growth regulators. Preparation and application of Bordeaux

solution and paste. Identification of important pests and diseases of fruit crops and their control. Harvesting, post-harvest treatments, grading and storage. Visit to commercial orchards

Suggested readings:

Hayes, W. B. Fruit Growing in India. Kitab Publishing Co., Allahabad.
Shanmugavelu, K. G. Production Technology of Fruit Crops, SBA Publishers, Kolkata.
Singh, Ranjeet. Fruits. National Book Trust Ltd., New Delhi.
Sham Singh. Fruit Growing. Kalyani Publishers, New Delhi.
Bose, T. K. and S. K. Mitra. Propagation of Tropical and Subtropical Horticultural Crops, Naya Udyog, 206, BidhanSavani, Kolkatta-700016.
Baker, H. Fruits. Mitchell Meagrely Publications, London.
Singh, A. Fruit Production and Technology. Kalyani Publishers, New Delhi.
Yadav, P. K. Fruit Production Technology. International Book Distributing Co., Division, Lucknow, Inida.
Sharma, R. R. Fruit Production Problems and Solutions. International Book Distributing Co., Division, Lucknow, India.
Kumar, P. Management of Horticultural Crops. (HortSciene Series Vol. 11, New India Publishing Agency, NIPA).
Kumar, P. Management of Horticultural Crops. (HortSciene Series Vol. 11, New India Publishing Agency, NIPA).
Kunte, Y. N, Kawthalkar, M. P., Yawalkar, K.S. Principles of Horticulture and Fruit growing, Agro-Horticultural Pub.House, Nagpur.

LPM 101 Livestock and Poultry Management 2 (1+1)

Objective: To understand the different components of the animal husbandry practices in relation to agriculture

Course outcome: Upon completion of the course students will be able to;

- Explain what is animal husbandry and its components.
- List types of farm animals, fodder types and animal improvement.
- How to organize the poultry production on farm?
- Animal health management and medication protect animals from diseases.

Theory

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry. Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.

Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipment. Management of chicks, growers and layers. De-beaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

Suggested readings:

Singh, R.A. Poultry Production. Kalyani Publishers, New Delhi
 Maske, O Norton. Commercial Chicken Production. Manuel AVI Publishers, INC West Port.
 Devendra, C. and G. B. McElroy. Goat and Sheep Production in Tropics – Long man Group Ltd., London.
 Wong, et al. Fundamentals of Dairy Chemistry. Publishers Van Nastrand Rain hold Comp. New York
 Ling, E.R. Text Book and Dairy Chemistry. Chapman Hall Ltd., London.
 Sukumar de Outline of Dairy Technology.
 Dairy processing Hand book
 Banerjee, G. C. Text Book of Animal Husbandry. Oxford and IBH Publishers, New Delhi.
 Sashry, C.K. Thomas and R. A. Singh. Farm Animal Management and Poultry Production. NSR, Vikas
 Publishing House Pvt. Ltd., Delhi.
 Hand book of Animal Husbandry, ICAR, New Delhi.
 Panda, B. and et al. Feeding of Poultry. ICAR, Publication, New Delhi.
 Singh, R.A. Poultry Production. Publishers, New Delhi

ICT 101 Information and Communication Technology 2 (1+1)

Objective: To provide usage of various computer based software packages, word processing and creation of documents and storage.

Course outcome: Upon completion of the course students will be able to;

- Able use computer and various packages.
- Able to use word, excel, PowerPoint packages.
- Able to create document, word processing, data management, creation of graphs etc.

Theory

UNIT I: IT and its importance; IT tools; IT-enabled services and their impact on society; Computer fundamentals; Hardware and software; Input and output devices; Word and character representation. **UNIT II:** Features of machine language, assembly language, high-level language and their advantages and disadvantages; Principles of programming - algorithms and flowcharts. **UNIT III:** Operating systems (OS) - definition, basic concepts; Introduction to WINDOWS and LINUX Operating Systems; Local area network (LAN); Wide area network (WAN); Internet and World Wide Web; HTML and IP. **UNIT IV:** Introduction to MS Office - Word, Excel, Power Point; Audio visual aids - definition, advantages, classification and choice of A.V. aids; Criteria for selection and evaluation of A.V aids; Video conferencing; Communication process, Berlo's model, feedback and barriers to communication.

AI in agriculture: Benefits, agricultural robots, predictive analytics, machine learning, big data, sata science and digital agriculture.

IoT in agriculture: Applications and implications, data collection, management and interpretation of data, interactive app. useable in smart agriculture, precision agriculture and smart greenhouse, mobile based app. and on-line crop management recommendations, data storage and retrieval mechanisms.

Practical:

Exercises on binary number system; Algorithm and flow chart; MS Word; MS Excel; MS Power Point; Internet applications: web browsing, creation and operation of email account; Analysis of data using MS Excel; Handling of audio visual equipment's; Planning, preparation, presentation of posters, charts, overhead transparencies and slides; Organization of an audio visual program.

Suggested readings:

Gurvinder Singh, Rachhpal Singh and Saluja KK. 2003. Fundamentals of Computer Programming and Information Technology. Kalyani Publishers.
 Harshawardhan P. Bal. 2003. Perl Programming for Bioinformatics. Tata McGraw-Hill Education.
 Kumar A 2015. Computer Basics with Office Automation. IK International Publishing House Pvt Ltd.
 Rajaraman V and Adabala N. 2015. Fundamentals of Computers. PHI Recommended Latest Online Tutorials (over Internet).

Objective: To provide insights on the economic valuation of goods and services of agricultural landscapes.

Course outcome: Upon completion of the course students will be able to;

- Identify goods and services of agricultural landscapes.
- Develop benchmark valuation models – Demand and supply with a value.
- Explain the economic benefits of natural resources.

Theory

Agricultural Economics: Meaning, Definition, Scope and Importance of Agricultural Economics Basic Concepts: Goods, Services, Utility, Value, Price, Wealth, and Welfare, Consumption Wants: Meaning, Characteristics, Classification of Wants, Importance. Utility: Definition, Forms, Law of Diminishing Marginal Utility, Law of Equi-marginal Utility Measurement of Utility Factors of Production: Land, Labour, Capital and Organization Definition, Meaning, Importance. Demand and Supply: Definition, Meaning, Laws, Factors affecting, Types, Determinants. Elasticity: Definition, Types Natural Resource Economics: Natural Resources – Meaning and Importance of Natural Resources. Renewable and Non-Renewable Natural Resources – Meaning and Importance.

Practical:

Exercise on Land Use Classification, Crop Patterns, Distribution of Ownership and Operational Land, Trends in Wages, Area, Production and Productivity of Major Crops in the State. Study of Trends in Natural Resources of Odisha and India viz; Land, Forest, Water and Fisheries Estimation of Degrees of Elasticity of Demand, Estimation of Degrees of Elasticity of Supply, Estimation of Equimarginal Utility.

Suggested Readings:

S. Subba Reddy *et al.* Agricultural Economics. Oxford & IBH Publishing Company Pvt. Ltd, New Delhi.
Email:oxford@oxford-ibh.in
Talathi J. M. *et al.* Introduction to Agricultural Economics and Agribusiness Management Books India New Delhi.
Agrawal, A.N. Indian Agriculture: Problems, Progress and Prospects. Vikas Publishing House Pvt. Ltd., Delhi.
Owen Oliver. Natural Resource Conservation and Ecological Approach. MacMillan Co. 866, Third Avenue, New York – 10022
Dewett, K. K, G.C. Singh and J.D. Varma. Elementary Economic Theory. S. Chand and Co., Ltd., 7361, Ram Nagar, Qutab Road, New Delhi-110 055
Dewett, K.K. Modern Economic Theory.
Shyam Lal Charitable Trust, Ravindra Mansion Ramnagar, New Delhi –110 055.

ABM 101 Principles of Agribusiness and Management 2 (1+1)

Objective: To expose students to principles of agri-business and its role in input-output management in agriculture.

Course outcome: Upon completion of the course students will be able to;

- Able to comprehensively analyze the utility of agri-business management.
- Gained knowledge on functions of agri-business.
- Explain the planning and organization of elements of agri-business.
- Acquired the skills to keep accounts and balance sheet books.

Theory

Agri-business: Meaning, definition, history and scope of agri-business (Input, Farm Product Sectors). Importance of agri-business in the Indian economy. Changing dimension of agricultural business. Agri-business Management-distinctive features, nature and components.

Introduction to Management-Management functions -Management Levels-Managerial roles-Management skills-Definitions of management-Role of management. Elements, Levels, Process & Functions of Management, Functions of Management:

Planning: Definition importance, characteristics, Steps in planning, types of planning Nature and Importance-Purpose of Planning-Forms of planning- types of planning -Steps in planning -Limitations of planning. Organizing: Meaning-definition, importance, Characteristics/Nature of organization. Principles & Process of organization. Directing-definition, functions, techniques, qualities of good supervisor. Controlling –Definition, Elements, Process of control, Techniques/ Tools of control. Farm business analysis - Farm efficiency measures, farm financial & cash accounts, Net worth statement, systems of book keeping.

Practical:

Study of various business models in agri-business. Study of farm records. Study of Systems of book keeping. Study of measures of farm income. Study of measures of farm efficiency. Study of farm planning techniques & situations. Study of farm budgeting techniques & types. Study of farm inventory. Study of cost ratios, capital ratio. Study of balance sheet financial ratio analysis.

Suggested readings:

K.Loknandhan, K.Mani, K.Mahendran Innovations in AB
D.K.Tripathi Principles& Practices of Management.
S.S.Johl, T.R.Kapoor Fundamentals of farm business management

ENG 101 Comprehensive and Communication Skills in English 2 (1+1)

Objective: Train in use of English as communication language and writing technical content.

Course outcome: Upon completion of the course students will be able to;

- Able to effectively speak and use English in conversation in an academic environment.
- Reliably demonstrated the ability to use the conventions of grammar when creating paragraphs.
- Effective in comprehension of a technical writing, develop manuscripts and reports.

Theory

1. Education 2. Employment 3. Unemployment 4. Application 5. Planning 6. Curriculum Vitae 7. Interview 8. Reporting 9. General Knowledge; 10. Stress 11. Short Story 12. Environment 13. Computerecy 14. A Dilemma 15. Entertainment, 16. You and Your English 17. Usage and Abuse 18. War Minus Shooting

Practical:

Vocabulary- Antonym, Synonym, Homophones, Homonyms; Functional grammar: Articles, Prepositions; Verb, Subject-Verb Agreement; Written Skills: Paragraph writing, Precise writing; The Style: Importance of professional writing; Preparation of Curriculum Vitae and Job applications; Interviews: kinds, Importance and process; Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Stress and Intonation, Conversation practice. Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions.

Suggested readings

Krishnaswamy, Nand Sri raman, T. 1995. Current English for Colleges. Macmillan India Ltd. Madras.
Balasubramanyam M. 1985. Business Communication. Vani Educational Books, New Delhi.
Naterop, Jean, B. and Rod Revell Telephoning in English. 1997. Cambridge University Press, Cambridge.
Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd. New Delhi.
Narayanaswamy V R. 1979. Strengthen your writing. Orient Longman, New Delhi.
Sharma R C and Krishna Mohan. 1978. Business Correspondence. Tata Me Graw Hill Publishing Company, New Delhi.

Carnegie, Dale. 2012. How to Win Friends and Influence People in the Digital Age. Simon & Schuster.
Covey Stephen R. 1989. The Seven Habits of Highly Successful People. Free Press.
Spitzberg B, Barge K & Morreale, Sherwyn P. 2006. Human Communication: Motivation, Knowledge & Skills. Wadsworth.
Verma, KC. 2013. The Art of Communication. Kalpaz.
Mamatha Bhatnagar and Nitin Bhatnagar. 2011. Effective Communication and Soft Skills. Person Education.
Meenakshi Raman, Sangeeta Sharma. Technical Communication Principles and Practice
Harold Wallace and Ann Masters. Personality Development. Cengage Publishers.

HME Human Values and Ethics 1 (1+0)

Objective: To inculcate the principles and moral values of human existence and philosophy.

Course outcome: Upon completion of the course students will be able to;

- Practice ethical approach to life.
- Treat people with compassion and selflessly offer service.
- Be self-aware of spiritualism and its importance in mindfulness.
- Able to carry balanced mind and positive attitude.

Theory

UNIT I: Universal human aspirations: Happiness and prosperity; Human values and ethics: Concept, definition, significance and sources; Fundamental values: Right conduct, peace, truth, love and non-violence; Ethics: professional, environmental, ICT; Sensitization towards others particularly senior citizens, developmentally challenged and gender.

UNIT II: Spirituality, positive attitude and scientific temper; Team work and volunteering; Rights and responsibilities; Road safety; Human relations and family harmony; Modern challenges and value conflict: Sensitization against drug abuse and other social evils; Developing personal code of conduct (SWOT Analysis); Management of anger and stress.

Suggested readings:

Gaur RR, Sangal R & Bagaria GP. 2011. A Foundation Course in Human Values and Professional Ethics. Excel Books.
Nagrajan R. S. 2006. Professional Ethics and Human Values. Text book. New Age International (P) Ltd Publishers.
Sharma RA. 2011. Human Values and Education -Axiology, Incultation and Research. R. Lall Book Depot.
Sharma RP & Sharma M. 2011. Value Education and Professional Ethics. Kanishka Publishers.
Srivastava S.S K Kataria & Sons. 2011. Human Values and Professional Ethics.
Srivastava S. 2011. Tripathi A.N. 2009 Environmental Science. Human Values. New Age International (P) Ltd Publishers.
Mathur SS. 2010. Education for Values, Environment and Human Rights. RSA International.
Encyclopedia of Ethics, 2nd ed. D. H. Hill Ref. BJ63 E45 2001 3 vols.

PEY 101 Physical Education and Yoga Practices 1 (0+1)

Objective: To introduce the students to yogic asanas and health improving physical exercises.

Course outcome: Upon completion of the course students will be able to;

- Explain the importance the physical exercises and yogic asanas.
- Practice various yogic asanas.
- Spread awareness on the utilities of yoga.

Theory and Practical:

Introduction to physical education. Posture, exercise for good posture, physical fitness exercises for agility, strength, coordination, endurance and speed. Rules and regulations of important games, skill development in any one of the games, football, hockey, cricket, volleyball, badminton, throw ball, tennis. Participation in one of the indoor games, badminton, chess and table tennis. Rules and regulations of athletic events, participation in any one of the athletic events, long jump, high jump, triple jump, javelin throw, discuss throw, shot put, short and long distance running, Safety education, movement education, effective way of doing day-to-day activities. First-aid training, coaching for major games and indoor games. Asans and indigenous ways for physical fitness and curative exercises. Exercises and games for leisure time, use and experience.

GDS 101 Good Governance and Democratic Society 1 (1+0)

Objective: To provide insights on the concepts of good governance under democracy.

Course outcome: Upon completion of the course students will be able to;

- Able identify the benefits of democratic governance.
- Understand the electoral process and constitutional rights of a citizen.
- Comprehensively understand the role of good governance in agriculture and rural development.

Theory

Democracy in India, Dimensions of Democracy: Social, Economic and Political, Decentralization: Grassroots Level Democracy– Challenges before Democracy: women and marginalized sections of the society, Election to Local Self Government Bodies– 73rd and 74th Constitutional Amendment Acts: Institutions at the local level and Role of State Election commission– Local Body Elections: Urban & Rural– Duties of an Individual towards electoral process

Good Governance– Meaning and concept, Government and Governance– Good Governance initiatives in India, Democracy and the rule of law, Pro-poor governance, Gender equality, corruption prevention, human rights, law and justice, decentralization, e-governance, communication media, urban and municipal development, reforming public finance, public administration, strengthening good governance in the agricultural and rural sector, good governance in the digitally enabled society.

EMT 101 Elementary Mathematics 2 (2+0)

Objective: To introduce basic mathematical theories useful to understand the mathematical approaches used in agriculture.

Course outcome: Upon completion of the course students will be able to;

- Explain the mathematical functions.
- Apply general form of equations in calculations.

Theory

Matrices-Definition of matrices, Addition of matrices, Subtraction of matrices, Scalar Multiplication, product of Matrices, Types of Matrices, Transpose of matrix, minor and cofactor. Inverse of matrix by adjoint method up to third order. **Determinants** -Definition of determinant as a function of square matrices, evaluation of determinant of second and third order only. Properties of determinants. **The Plane Co-ordinate Geometry**- Distance Formula, Section Formula, Section formula for internal division, Section formula for External division. (Without proofs). **Straight Lines**-Equation of co-ordinate axes, Equation lines parallel to axes, Slope –Intercept form of equation of line, Slope -Point form of equation of line, Two Point form of equation of line, Intercept form of equation of line, General form of equation of line (Statements of form of equations only), Point of intersection of two straight lines, Angle between two straight lines, conditions for two lines to be parallel and perpendicular. **Circle** - Definition of circle, various forms of equation of circle i.e. centre-radius form, standard form, three-point form, diameter form and General form. **Mensuration**-Illustration of ordinates of curve and common distance between ordinates, Statement of Simpson's 1/3rd Rule (Without proof), Examples based on Simpson's rule. **Function, Limit &Continuity**- Definition of function, types of function, Theorems on limits (statement only), Definition of continuity, Simple Problems on limit, Simple Problems on continuity. **Differential Calculus**-Definition of Derivatives, functions (Formulae's), Derivatives of Sum, difference, functions (statement only), Differentiation of function simple problems based on it. **Integral Calculus** - **Indefinite**

integral: Definition, integrals of elementary functions (Formulae) Theorems, Integration of functions by decomposition method, Examples based on it. **Integral Calculus & its Application** -Definite integral: Definition of Definite Integral, Examples based on it, Area under simple well-known curves. (simple problem based on it.) Differentiation of simple product and quotient of two of function (statement only),

Suggested readings:

MVSL DN Raju and Dr. K.V. Ramana – Engineering Mathematics-1
MVSL DN Raju and Dr. K.V. Ramana – Engineering Mathematics-2
Text Book for A.P Intermediate Mathematics – Paper (IA & IIB).
MVSL DN Raju and K.V. Ramana - Agricultural Mathematics.

IBL 101 Introductory Biology 2 (1+1)

Objective: To sensitize students about the basics of biology in special reference to botany.

Course outcome: Upon completion of the course students will be able to;

- Know about the various parts of an angiospermic plant.
- Know about the evolutionary process and binomial classification.
- Explain 3 important families such as, Brassicaceae, Fabaceae and Poaceae.

Theory

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics. Binomial nomenclature and classification Cell and cell division. Morphology of flowering plants. Seed and seed germination. Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

Practical:

Morphology of flowering plants – root, stem and leaf and their modifications. Inflorescence, flower and fruits. Cell, tissues & cell division. Internal structure of root, stem and leaf. Study of specimens and slides. Description of plants - Brassicaceae, Fabaceae and Poaceae.

Suggested readings:

P.S. Verma, V.K. Agrwal. S. Chand Cell Biology, Genetics, Molecular Biology and Evolution, and Company Ltd. Ram Nagar New Delhi.
Edwin H. Colber Evolution of Vertebrates, t, A Wiley, Interscience Publication, John Wiley and Sons New York.
A.C. Dutta A class- book of Botany. Oxford University press
B.D. Singh Fundamentals of Genetics, Kalyani Publishers B-I/1292, Rajinder Nagar, Ludhiana- 141008
Ashok M. Bendre, Dr. Ashok Kumar. Rastogi A Text book of Practical Botany-2 Publications Shivaji Road, Meerut – 25002, India
James D. Mauseth Botany- An introduction to Plant Biology. Contental Prakashan 1962
A.C. Datta, Sigh V. Pande P.G Anatomy of seed Plants, Sai print o pack New Delhi Rastogi, Publication Meerut.

AGR 102 Crop Production Technology- II (Rabi crops) 2 (1+1)

Objective: Provide basic knowledge about production of rabi crops.

Course outcome: Upon completion of the course students will be able to;

- Accumulated the knowledge on morphological characters of various rabi crops.
- Explain about soil and climatic requirements of different rabi crops.
- Identify cultural practices associated with various rabi crops

- Identify the yield contributing characters and calculation of yield.

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season crops, study of morphological characteristics of *rabi* crops, study of yield contributing characters of *rabi* season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of *rabi* crops at experimental farms. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

Suggested readings:

Rajendra Prasad. (2006). Text book of field crops production. ICAR, New Delhi.
 Reddy, S.R and Reddi Ramu. 5th edition. (2016). Agronomy of field crops. Kalyani publishers, Ludhiana.
 Gururaj hunsigi and Krishna, K.R. (2007). Scientific field crop production. Oxford & IBH Publishing Co. Pvt. Ltd.
 De Datta, S.K. (1981). Principles and practices of rice Production. John Wiley and Sons, New York
 Singh, C., Singh, P and Singh, R. (2003) Modern techniques of raising field crops. Oxford & IBH Publishing house, New Delhi.
 Panda S.C. (2014) Agronomy of fodder and forage crops, Kalyani publishers, Ludhiana.

VFM 102 **Production and Management of Vegetables, Floricultural, Aromatic and Medicinal Crops. 3 (2+1)**

Objective: To provide exposure to scientific cultivation and management of commercial horticultural crops viz., vegetables, flowers and medicinal plants

Course outcome: Upon completion of the course students will be able to;

- Able to plan the cultivation of various commercial horticultural crops.
- Able to raise the planting material using seeds, grafting etc.
- Able to identify plants suitable for horticultural garden or kitchen garden.

Theory

Vegetable: Definition, scope and importance of vegetable crops, area, production, distribution, exports and imports of vegetables from Odisha and India. Nutritive value, classification of vegetables, type of vegetable farming – kitchen garden, market garden, truck garden, vegetable production for processing, vegetable seed production, role of growth regulators in vegetable production. Cultivation of major vegetables like Tomato, Potato, Chilli, Brinjal, Onion, , Cabbage, Cauliflower, Watermelon, Cucumber and minor vegetables like Methi, Coriander, Palak, Amaranthus, Lettuce, Drumstick, Tondali. Note: tabular form crops: garlic, peas, beans, muskmelon, bitter gourd, bottle gourd, ridge gourd, red pumpkin, sponge gourd, snake gourd and minor vegetables like methi, coriander, palak, amaranthus, lettuce, drumstick, tondali, Floriculture: Importance and scope of floriculture industry in Odisha and India. Horticulture gardening. Principles of garden design (Formal and Informal garden and Land scaping), Production technology of rose, chrysanthemum, aster, carnation, jasmine, marigold, gladiolus, tuberose, gaillardia, orchids, anthurium, gerbera and dahlia. (Give brief cultivation information in tabular form for minor vegetable and flower crops). Note: tabular form crops: Aster, Carnation, Jasmine, Marigold, Tuberose, Gaillardia, Orchids, Anthuriu and Dahlia.

Practical:

Identification of vegetable and ornamental plants. Planning and layout of kitchen garden. Raising and transplanting of vegetable seeds and seasonal flowers. Training and pruning of roses and pinching and disbudding in chrysanthemum. Planning and layout of gardens and garden designs for public and private areas. Intercultural operation in vegetable and

ornamental/flower crops. Identification of important pests and diseases of vegetable and floricultural crops. Flower arrangement and prolonging the vase life of cut flowers. Working out cost of cultivation of vegetable and floricultural crops (one crop each). Visit to commercial vegetable and floriculture gardens. Identification of aromatic and medicinal plant.

Suggested readings:

Bose, T. K., Som, M. C. and Kabir. Vegetable Crops. Naya Prokash, Calcutta Chaudhari, B. Vegetables. National Book Trust of India.

Bose, T. K. and L. P. Yadav. Commercial Flowers. Naya Prokash, Calcutta.

Radha, J. H. and A. Mukhopadhyay. Floriculture in India. Allied Publishing Pvt. Ltd., New Delhi.

Prasad, S. 2005. Commercial Floriculture. Agrobios (India), Jodhpur.

Singh, A. K. 2006. Flower Crops: Cultivation and Management. New India Publishing Agency, NIPA.

Gopalkrishnan, T. R. 2007. Vegetable Crops. (Hort. Science Series Vol. 4. New India Publishing Agency, NIPA.

Shinde S. J., S.D. Jature & B.G. Hiwale. 2008. A Text Book on Production Technology of Vegetables & Flowers. Shri Rajlaxmi Prakashan. Aurangabad. Chadda. K.L. Handbook of Horticulture. ICAR.

Nalage N.A. Navigator for Horticulture. Universal Prakashan, Pune.

PPB 102 Principles of Plant Biotechnology 2 (1+1)

Objectives: Provide insights on basic theory, principles, tools used in biotechnology.

Course outcome: Upon completion of the course students will be able to;

- Acquainted with genetic make-up of life-form.
- Acquired on knowledge on r-DNA technology for development of transgenic variety.
- Acquired knowledge about how the principles of totipotency useful for
- Able to develop complete plant through tissue culture.

Theory

Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement: Totipotency and Morphogenesis, Nutritional requirements of in-vitro cultures; Techniques of In-vitro cultures, Micropropagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture, Factors affecting above in-vitro culture; Applications and Achievements; Somaclonal variation, Types, Reasons: Somatic embryogenesis and synthetic seed production technology; Protoplast isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering; Restriction enzymes; Vectors for gene transfer – Gene cloning – Direct and indirect method of gene transfer – Transgenic plants and their applications. Blotting techniques – DNA finger printing – DNA based markers – RFLP, AFLP, RAPD, SSR and DNA Probes – Mapping QTL – Future prospects. MAS, and its application in crop improvement. Nanotechnology: Definition and scope, types of nano material and their synthesis, green synthesis. Tools and techniques to characterize the nano particles. Nano-biotechnological applications with examples, Nano toxicology and safety.

Practical:

Requirements for Plant Tissue Culture Laboratory; Techniques in Plant Tissue Culture; Media components and preparations; Sterilization techniques and Inoculation of various explants; Aseptic manipulation of various explants; Callus induction and Plant Regeneration; Micro propagation of important crops; Anther, Embryo and Endosperm culture; Hardening / Acclimatization of regenerated plants; Somatic embryogenesis and synthetic seed production; Isolation of protoplast; Demonstration of Culturing of protoplast; Demonstration of Isolation of DNA; Demonstration of Gene transfer techniques, direct methods; Demonstration of Gene transfer techniques, indirect methods; Demonstration of Confirmation of Genetic transformation; Demonstration of gel-electrophoresis techniques. Green synthesis of nano particles and their size characterization.

Suggested Reading:

Singh, B D, 2004. *Biotechnology Expanding Horizons* 2nd Edn. Kalyani Publishers, New Delhi.

Gupta, P.K., 2015. *Elements of Biotechnology* 2nd Edn. Rastogi and Co., Meerut.

Razdan M K, 2014. *Introduction to plant Tissue Culture* 2nd Edn. Science Publishers, inc. USA.

Gautam V K, 2005. *Agricultural Biotechnology*. Sublime Publications

Thomar, R.S., Parakhia, M.V., Patel, S.V. and Golakia, B.A., 2010. *Molecular Markers and Plant biotechnology*, New Publishers, New Delhi.

Purohit, S.S., 2004. *A Laboratory Manual of Plant Biotechnology* 2nd Edn. Agribios, India.

Singh, B.D. 2012. *Plant biotechnology*. Kalyani publishers, Ludhiana

Bilgrami, K.S. and Pandey, A.K.1992. *Introduction to biotechnology*. CBS Pub. New Delhi

Gupta, P.K. 1994. *Elements of biotechnology*. Rastogi Pub. Meerut.

Chahal, G.S. and Gosal, S.S.2003. Principles and procedures of plant approaches breeding Biotechnological and conventional. Narosa Publishing House, New Delhi.

SWP 102 Soil, Water and Plant Analysis 2 (1+1)

Objective: To provide theoretical insights on soil, water and plant analysis for nutrients and contaminants.

Course outcome: Upon completion of the course students will be able to;

- Able to collect a representative sample and process it for laboratory analysis.
- Able identify suitable chemical method/s of analysis- qualitative and quantitatively analyze the environmental samples.
- Able to interpret the results for nutrient sufficiency, deficiency, toxicity and contamination levels.
- Able to provide remedial measures and recommendations.

Theory

Importance and objectives of soil, water and plant analysis Principles of instrumentation in soil, water and plant analysis, Methods of soil, water and plant sampling and processing for analysis, Nutrient mobility, diffusion and mass flow, Renewal of gases in soil and their abundance, Principles and methods of measurement of oxygen diffusion rate and redox potential, Radio tracer technology application in plant nutrient studies and fertility evaluation, Soil micro-organisms and their importance, Saline and alkali appraisal and management, Acid soil appraisal and management, Waterlogged soil appraisal and management, Sandy soil appraisal and management, Chemical and mineral composition of horticultural crops, Leaf analysis standards , index tissue, interpretation of leaf analysis values Rapid tissue test for plant, Management of poor quality irrigation water in crop management Soil pollution and water pollution.

Practical:

Collection and preparation of soil, water and plant samples for analysis, Preparation of standard solutions, Determination of pH and EC of soil, Determination of SAR and ESP of soil, Estimation of moisture content in soils and plants, Determination of available nitrogen in soil, Determination of available phosphorus in soil, Determination of available potassium in soil, Determination of DTPA extractable micronutrients in soil, Determination of DTPA extractable micronutrients in soil, Determination of boron, Determination of pH and EC in irrigation water samples, Determination of Carbonates , bicarbonates sulphates and chlorides in irrigation water, Determination of calcium, magnesium , sodium , potassium and Boron in irrigation water, Determination of NPK calcium , magnesium and sulphur in plant sample, Determination of micronutrients in plant sample, Preparation of plant nutrient deficiency symptoms album.

Suggested readings:

Jackson, M.L. Soil Chemical Analysis. Prentice Hall of India Pvt. New Delhi

Klute, A. Methods of Soil Analysis. Soil Sci. Soc. Am. Inc. Madison, Wisconsin, USA.

Page, A.L., Millar, R. H. and R. D. Keeney. Methods of Soil Analysis. Soil Sci. Soc. Am. Inc. Madison, Wisconsin, USA.

Piper, C. S. Soil and Plant Analysis. Academic press., New York.

Westerman, R. L. Soil Testing and Plant Analysis. No. 3, Soil Sci. Soc. Am. Inc. Madison, Wisconsin, USA.

VAP 102 Value Addition in Animal Products 2 (1+1)

Objective: To provide exposure to various animal products and the process of value addition.

Course outcome: Upon completion of the course students will be able to;

- Able list all the animal products on the basis of their utility.
- Able to apply the process of value addition and quality control.
- Able understand the price fixation, marketing and rules of industries under WTO guidelines.

Theory

Present status of dairy, poultry, meat, wool and hide industries in WTO regime. Milk composition of different species. Production, packing, marketing of milk, meat and their products. Import, export of animal and poultry products. Utilization of animal dung, poultry manure for F.Y.M. and vermi-compost, gobar gas production and its valuation, price regulation in animal products. Factors influencing price. Trends in marketing and utilization of animal products. Importance of hides and bones, quality standards and storage. Market standards and regulation of animal products.

Practical:

Organoleptic quality and evaluation of milk and milk products- meat, egg, wool and chicken. Physical properties of milk, meat, egg, wool and chicken. Chemical composition of different animal and poultry products. Visit to different slaughter houses may be included

Suggested readings:

Singh, R.A. Poultry Production. Kalyani Publishers, New Delhi.
 Maske, O Norton. Commercial Chicken Production. Manuel AVI Publishers, INC West Port.
 Devendra, C. and G. B. McElroy. Goat and Sheep Production in Tropics – Long man Group Ltd., London.
 Wong, et al. Fundamentals of Dairy Chemistry. Publishers Van Nostrand Reinhold
 Ling, E.R. Text Book and Dairy Chemistry. Chapman Hall Ltd., London.
 Sukumar Outline of Dairy Technology. Dairy processing Hand book.

FST 102 Farm Structure and Protected Environment technologies 2 (1+1)

Objective: To provide overall structure of a farmstead.

Course outcome: Upon completion of the course students will be able to;

- Able to comprehensively understand the components of a farmstead.
- Able to develop a masterplan of farmstead with logical placement of its components.
- Able to identify various environmental technologies used in management of farmstead.

Theory

Introduction, location, size and arrangement of farmstead, planning of farm residence, Disposal field - septic tank, soak pit, its location, capacity, construction and maintenance. Farm fencing and its types. Animal shelter and their types. Poultry housing and their types: Building materials. Farm silos and their types. History, development and scope of greenhouse technology. Types of green houses. Green house planning, layout and its construction. Effect of temperature, pH and CO₂ with reference to micro-climate on greenhouse crops. Role of light, ventilation, cooling, utility of green house for different crop production, covering material, irrigation, fertigation and humidification inside green house.

Practical:

Planning and layout of farmstead. Planning and layout of dairy barn. Planning and layout of poultry house. Study of farm fencing. Study of building materials. Study of silos. Study of planning of greenhouse. Study of construction materials for green house. Study of glazing material. Study of irrigation system for green house. Study of cooling system for green house. Visit to various greenhouses/dairy barn/poultry houses

Suggested readings:

A. M. Michael, and T. P. Ojha Principles of Agricultural Engineering. Vol. I, Jain Brothers., New Delhi.
 Sawant B.P., Potekar J. M. and H. W. Awari. A text book of Greenhouse and Post-Harvest Technology. Nikita Publication, Latur
 P. V. Nelson. Green House Operation and Management. Reston Pub. Co. Inc. prentice Hall

Co. Reston, Virginia.

K. Radha Manohar, and C. Igathinathane Greenhouse – Technology & Management. Publications, Hyderabad.

Tiwari, GN. and R. Green House Technology – Fundamentals, Design, Modelling and Application. K. Goyal. Naroso Publishing Co. Bombay.

FCP 102 Fundamentals of Crop Protection 3 (2+1)

Objective: To provide exposure to theoretical concepts of protection of various crops by insect pest and disease causing pathogens.

Course outcome: Upon completion of the course students will be able to;

- Able identify various insect pests of field crops, fruits, vegetables and plantation crops.
- Able identify various disease causing pathogens of field crops, fruits, vegetables and plantation crops.
- Able identify suitable control measures using various chemical control agents and management practices.

Entomology

Theory

Systematic and Taxonomy – Classification and characteristics of Phylum Arthropoda & Characteristics of Hexapoda, **1.** Morphology of insects, **2.** Major pests in following crops: **a.** Scientific name, **b.** Symptoms of insect damages, **c.** Lifecycle of insect/pests, **d.** Management of insects, **Cash crops-** Sugarcane, cotton, **Cereals-** Paddy, Jawar, Bajra, Wheat, Maize, **Pulses-**Pigeon pea, **Oilseed crops-** Ground nut, Soya bean, **Fruits-** Mango, Grapes, Pomegranate, Citrus, Banana, **Vegetable crops-** Brinjal, Okra, Tomato, Chilly, Onion, Cabbage & cauliflower. Honey Bees and Bee-keeping, Silkworms and Sericulture & Pests of stored products and their management

Practical:

Collection and preservation of insects, Identification of insects and their damages, Morphology of insects- Types of legs, Types of mouthparts, Types of antenna & Dissection of cockroach (Digestive system)

Assignment: Each student should collect at least 100 insect specimens belonging to the aforesaid orders.

Plant Pathology

Theory

Introduction to the science of phytopathology, its objectives, scope and historical background. Classification of plant diseases, symptoms, signs, and related terminology. Parasitic causes of plant diseases (fungi, bacteria, viruses, phytoplasma, protozoa, algae and flowering parasitic plants), their characteristics and classification. Non-parasitic causes of plant diseases. Infection process. Survival and dispersal of plant pathogens. Plant disease epidemiology, forecasting and disease assessment. Principles and methods of plant disease management. Integrated plant disease management. Fungicides classification based on chemical nature, commonly used fungicides, bactericides and nematicides

Practical:

Familiarity with general plant pathological laboratory and field equipment. Study of disease symptoms and signs and host parasite relationship. Identification and isolation of plant pathogens. Koch's postulates. Preparation of fungicidal solutions, slurries, pastes and their applications.

Suggested readings:

Richards O.W. and R.G. Davies – Imms' General Text Book of Entomology –Vol. I and I

Shrivastava K. P., A Text book of Applied Entomology, Kalyani Publishers, New Delhi.- Vol.1 and Vol.2

S. Manisegaran and Dr. R. P. Soundararajan, Pest Management In Field Crops (Principles And Practices)

Saxena R. C. and Srivastava R. C., Prasad T. V, Entomology at a Glance, Third Edition.

Handbook of Entomology New Vishals Publication, Revised Edition.

Walia RK & Bajaj HK. 2003. *Text Book on Introductory Plant Nematology*. ICAR, New Delhi

Pathak, V. N. Essentials of Plant Pathology. Prakash Pub., Jaipur

Agrios, GN. 2010. Plant Pathology. Acad. Press.

Kamat, M. N. Introductory Plant Pathology. Prakash Pub, Jaipur

Singh RS. 2008. Plant Diseases. 8th Ed. Oxford & IBH. Pub. Co.

Singh RS. 2013. Introduction to Principles of Plant Pathology. Oxford and IBH Pub. Co.

Alexopoulos, Mims and Blackwel. Introductory Mycology

Mehrotra RS & Aggarwal A. 2007. Plant Pathology. 7th Ed. Tata Mc Graw Hill Publ. Co. Ltd.

Gibbs A & Harrison B. 1976. *Plant Virology - The Principles*. Edward Arnold, London.

Hull R. 2002. *Mathew's Plant Virology*. 4th Ed. Academic Press, New York.

Verma JP. 1998. *The Bacteria*. Malhotra Publ. House, New Delhi.

Goto M. 1990. *Fundamentals of Plant Bacteriology*. Academic Press, New York.

Dhingra OD & Sinclair JB. 1986. *Basic Plant Pathology Methods*. CRC Press, London, Tokyo.

Nene YL & Thapliyal PN. 1993. *Fungicides in Plant Disease Control*. 3rd Ed. Oxford & IBH, New Delhi.

Vyas SC. 1993. *Handbook of Systemic Fungicides*. Vols. I-III. Tata McGraw Hill, New Delhi.

Rajeev K & Mukherjee RC. 1996. Role of Plant Quarantine in IPM. Aditya Books.

Rhower GG. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture. 2nd Ed. Vol. II. (Ed. David Pimental). CRC Press.

Singh RS & Sitaramaiah K. 1994. *Plant Pathogens – Nematodes*. Oxford & IBH, New Delhi.

Thorne G. 1961. *Principles of Nematology*. McGraw Hill, New Delhi.

BIT 102 Banking and International Trade 3 (2+1)

Objective: To provide broad exposure on money management, banking sector and trading guidelines at national and international arena.

Course outcome: Upon completion of the course students will be able to;

- Comprehensively define the money and its functions.
- Able to understand the functioning of banks and international trade guidelines.
- Able to explain the import-export policies in relation to agri-produce.
- Able to explain the WTO, GATT, IPR, TRIPS, TRIM etc. relevant to marketing of agri-produces.

Theory

Money: Meaning, importance, evolution, qualities of good money, coins and coinage, kinds of money, functions of money, demand for and supply of money, monetary standards, bimetalism, monometalism and paper standard.

Banking: Types of banks, role in economic development, functions and achievements of commercial banks. Central bank – banking principles and functions of central bank, measures of credit control, monetary policy. Nationalization of banks and its impacts, role of credit institutions in development of agriculture. **International Trade:** Meaning, definition, scope, pre-export behaviour-factors to be considered, methods of entering foreign markets, importance of International markets, economic reasons for export. **International marketing:** Practices and problems, policies and economic forces and political considerations. **GATT:** Basic principles and emergence of WTO. Trade codes, application of WTO. **Import-Export Policies:** Present Agril. Export Policy of the Govt. under liberalized economic environment. IPR, TRIPS, TRIM, AoA etc.

Practical:

Time Value of Money, Estimation of Exchange Rate (Example- Money/Dollar), Central Bank-RBI, NABARD, Nationalization of Banks, Commercial Bank and Co-operative Bank, Crop Insurance Scheme, Regional Rural Bank, Asian Development Bank, World Bank, Study of EXIM/Foreign Trade policy, Study of Present Agril. Export Policy

Suggested readings:

Dewett, K.K. Modern Economic Theory. Shyam Lal Charitable Trust, Ravindra Mansion Ramnagar, New Delhi –110 055.

R.R.Paul. Money, Banking and International Trade. Kalyani Publishers, Rajinder Nagar, Ludhiana-141008.

M.L.Jhingan., Vrinda Money Banking, International Trade and Public Finance. Publications(P) Ltd. B-5, Ashish Complex (Opp. Ahlcon Public School), Mayur Vihar, Phase –I, Delhi-110 091.

Dewett, K.K, G.C. Singh and J.D. Varma. Elementary Economic Theory. S. Chand and Co., Ltd.,7361, Ram Nagar, Qutab Road, New Delhi-110 055
S.Subba Reddy, P.Raghu Ram,T.V.Neelakanta Sastry,I. Bhavani Devi.Agricultural Economics.Oxford & IBH Publishing Co.Pvt.Ltd. New Delhi.110049.
Vaish, M.C. Monetary Theory.Ratan Prakashan, Educational and University Publishers, 21 DayanandMarg, Darya Ganj,New Delhi – 110 002.
Datta, Ruddar and K.P.M. Sundaram.Money, Banking and Trade. S. Chand and Co., Ltd., 7361, Ram Nagar, Qutab Road, New Delhi-110 055.

IAM 102 Introduction to Agricultural Marketing 2 (1+1)

Objective: To provide comprehensive knowledge on marketing of agricultural produce and logistics involved in the supply-demand-storage chain.

Course outcome: Upon completion of the course students will be able to;

- Able to understand the procedural protocols involved in marketing of agricultural produce.
- Able to understand the grading and quality control.
- Able to explain types of markets, warehousing, price fixation, market efficiency.

Theory

Agricultural Marketing: Definition and concepts, scope and subject matter. Market and marketing: Meaning, definition, components of a market structure, importance of agricultural marketing, classification, types of markets. Market forces- Demand and Supply. Problems of Agricultural Marketing: Defects in traditional Agricultural marketing system and suggestions for improvement. Standardization: Standards and standardization, aims of standardization, significance of standardization, demerits of standardization. Basis of standards. Grading: A marketing function. Importance of grading in agriculture, grading in India. Warehousing: State and Central Warehousing Corporations, objectives, functions, advantages, Channels of Marketing: Meaning, definition, channels of different products, market functionaries and their role. Marketing Efficiency: Meaning, definition, marketing costs, margin, price spread, factors affecting the cost of marketing, reasons for higher marketing costs of farm commodities, ways of reducing marketing cost. Study of Market Intelligence and Market Integration: Meaning, definition, types of market integration. Producer's surplus: Marketable Surplus and Marketed Surplus.

Practical:

Studies on estimation of marketing cost, price spread, market margins. Study on standardization, grading, storage, warehousing. Marketing of food grains, fruits, vegetable, milk and eggs. Exercises on grade standards of various Agricultural Products.

Suggested readings:

Acharya, S. S. And N. L. Agrawal. Agricultural marketing in India. (fifth edition) oxford and IBH publishing company pvt. Ltd., 66 Janpath, new Delhi - 110001.
S. S. China. Agricultural marketing in India. kalyani publisher, new Delhi 100 002.
S. Subba reddy *et. Al.*, Agriculture economics. (2010) oxford and IBH publishing company Pvt. Ltd., 66 Janpath, New Delhi – 110001

MIO 102 Marketing Institutions and Organizations 2 (1+1)

Objective: To exposure to various organizations and institutions involved in agri-produce marketing and control.

Course outcome: Upon completion of the course students will be able to;

- Able to explain the functioning of various agri-produce marketing institutions.
- Able to list various national and international organization controlling the markets of agri-produce.
- Comprehensively analyze the rural marketing institutions involved in organized distribution of agri-produce.

Theory

Objectives, structure and functioning of Agricultural Marketing Institutions and Organizations. Agricultural Produce Market Committee, Cotton Corporation of India and State Cotton Federation, Food Corporation of India (FCI), State Trading Corporation (STC), National Co-operative Marketing Federation, Agricultural Processed Products and Export Development Authority (APEDA), Odisha State Agricultural Marketing Board (OSAMB), The National Agricultural Co-operative Marketing Federation of India (NAFED), Jute Corporation of India, Tobacco Board, Coconut Board, Grape Growers Association (*Mahagraphe*), Mango Growers Association (*Mahamango*), The Directorate of Marketing and Inspection (DMI), National Dairy Development Board (NDDB).Coffee Board and Rubber Board.

Practical:

Visit to different marketing institutions/organizations (located in the local district) for study the organization, their function and achievements in marketing of farm products.

Suggested readings:

Acharya, S.S. and N.L. Agrawal. Agricultural marketing in India. Oxford and IBH publishing company Pvt. Ltd. 66, Janpath, New Delhi – 1
Memoria, C. B. And R.L. Joshi. Principles and practice of marketing in India. Kitab mahal, 15, thorn hill road, Allahabad.

AIN 102 Agro-Based Enterprises and Industrialization 2 (1+1)

Objective: To provide insights on the spurt of agriculture based enterprises and industrial agricultural practices.

Course outcome: Upon completion of the course students will be able to;

- Gained comprehensive knowledge on industrial agriculture and various enterprises.
- Gained a comprehensive knowledge on establishing a agri-based industry.
- Ability to develop a comprehensive plan for employment generation under the promotion of agri-enterprises.

Theory

Agro-based Industries: Importance and need, classification of industries, role of agro-processing industries in the Indian economy. Types of agro based industries-sugar mills, cotton ginning mills, dal mills, rice mills, poha mills, fruit processing industries institutional arrangement, steps in setting up of agro-based industries. Constraints in establishing agro-based industries. Basis of development of agro-based industries in specific pocket e.g. sugar mills, Ginning and processing of cotton, Dal mills and Rice mills etc. Growth and modernization of these Agro based industries in different regions – Modernization of industries, Employment and income generation from agro based industries at macro level and overall impact in the development of the region/State. Potential agro-based industries- Grape wine making industries, soya-processing industries, mango pulp processing industries.

Practical:

Study of oil processing industry, Study of dal processing industry, Study of milk processing industry, Study of wine processing industry, Study of fruits processing industry, Study of vegetables processing industry, Study of paddy processing industry, Study of wheat processing industry, Study of sugar industry & Visit to agro-processing industries of different commodities.

Suggested readings:

Strivastava, U.K. Agro-processing Strategy for Acceleration and Exports. Oxford University Press YMCA, Library Building, Jai Singh Road, New Delhi -110 001.
Divase, Smita. Agri-Business Management. Everest Publishing House, Everest Lane, 536, Shaniwarpath, Appa Balwant Chowk, Pune – 411 030.

FSA 203 Modern Farming System & Sustainable Agriculture 2 (1+1)

Objective: To provide comprehensive knowledge on the practices involved in modern and sustainable farming.

Course outcome: Upon completion of the course students will be able to;

- Able to differentiate the modern farming vis-à-vis sustainable farming principles.
- Explain integrated farming systems.
- Able to examine the ecological balance, land degradation, wasteland development etc.
- Able to apply the principles of precision farming in crop management.

Theory

Farming systems – Definition, scope, classification and components. Integrated Farming System (IFS), models for irrigated and rainfed situation. Cropping systems – indices for evaluation of cropping systems. Organic farming – Definition, principles and components. Sustainable agriculture - Introduction, definition, goal and current concepts. Factors affecting ecological balance and ameliorative measures Land degradation and conservation of natural resources – low external input agriculture (LEIA) and high external input agriculture (HEIA). Irrigation problems Waste lands and their development. Precision Farming- Importance Scope and Components.

Practical

Preparation of cropping scheme for irrigated situations; Preparation of cropping scheme for drylands situations; Study of existing farming systems in nearby villages; Preparation of integrated farming system model for wetlands; Preparation of integrated farming system model for dry lands; Preparation of enriched Farm Yard Manure; Preparation of Vermicompost; Visit to urban waste recycling unit; Study of profitable utilization of agricultural wastes; Visit to poultry and dairy units to study resource allocation, utilization and economics; Visit to an organic farm to study various components and utilization; Study of degraded lands.

Suggested readings:

B.N. and Maiti S. 1984 Cropping systems - Theory and practice. Chatterjee. Oxford and IBH Publishing Co., Calcutta, India.

Palanniappan S.P. Cropping systems in tropics – Principles and practices –1985. Willey Eastern Ltd., New Delhi.

Panda S.G. Soil management and organic farming. 2006. AGROBIOS, New Delhi.

Thapa U. and Tripathi P Organic Farming. 2006. Organic Farming in India, Problems and Prospects

K Palanippa S.P. and Anandurai Organic Farming – theory and practice. 1999. Scientific Publishers, Jodhpur.

Lampin, N. 1990 Organic Farming. Farming Press Books, Ipswich, U.K.

PHT 203 Post-Harvest Technology of Horticultural Crops 2 (1+1)

Objective: Provides knowledge on causes of post-harvest losses in horticultural crops and how different post-harvest management practices help to increase shelf life with preparation of different processed products.

Course outcome: Upon completion of the course students will be able to;

- Know about maturity indices, harvesting stages of different horticultural crops.
- Explain different factors responsible for deterioration of horticultural produce.
- Know about different post-harvest treatments of horticultural crops to reduce post-harvest losses.
- Explain different storage, packaging and transportation methods.
- Prepare different post-harvest products from fruit and vegetable and know about their standards and specifications.

Theory

Importance and present status of post-harvest technology in horticultural crops in India and Odisha. Maturity, harvesting and handling in relation to extended shelf-life and storage quality of fruits, vegetables and flowers. Maturity

and harvesting indices of fruits, vegetables and flowers. Factors responsible for maturity, ripening and deterioration of horticultural produce. Methods used for harvesting and post-harvest treatment for delaying ripening. Respiration and transpiration rate during packaging and storage. Methods of pre-cooling, grading, packaging, storage and transport of fruits, vegetables and flowers. Importance and scope of fruits and vegetable preservation. Selection of site for fruit and vegetable preservation unit. Principles and methods of preservation. Preparation of jams, jellies, marmalades, squashes, juices, syrups, preserves, crystallized fruits, chutney, pickle and ketchups. Spoilage of processed products. Post-harvest management of cut flowers. Control of post-harvest diseases of important fruits and vegetables.

Practical:

Studies on Maturity indices, harvesting of various fruits and vegetables. Pre-cooling, grading, packaging and storage of fruits and vegetables. Pre-harvest and post-harvest application of chemical substances. Harvesting, packaging, storage and marketing of cut flowers. Identification of different equipment used in processing of fruits and vegetables. Canning of fruits and vegetables. Preparation of jams, jellies, marmalades, squashes, juices, syrups, preserves, ketchup, pickles, chutney, etc. Drying of fruits and vegetables. Working out the economics of important processed products. Study of spoilage of different processed products. Visits to fruits and vegetables preservation units.

Suggested readings:

Pantastico, E. R., B. Post-Harvest Technology, Handling, Utilization of Tropical and Sub-Tropical Fruits and Vegetables. The AVI Publishing Co. West-Post, Connecticut, USA.
Salunke, D. K. and Desai, B. B. Post-Harvest Biotechnology of Vegetables. II CRC Press, Boca Raton, Florida.
Kader, A. A. Post-Harvest Technology of Horticultural Crops. Publication Co. 3311, University of California, Division of Agricultural and Natural Resources, California.
Varma, L. R. and V. K. Joshi. Post-Harvest Technology of Fruits and Vegetables, Vol. II. Indus Publishing Company, New Delhi-110 027.
Shrivastva, R.D and Kumar Sanjeev. Fruits and Vegetables (Principle and Practices). 3rd Edition.
Saraswathy,S,T.L.Preethi,S.Natarajan.Post Harvest Management of Horticultural Crops.AGROBIOS (INDIA).
Chadda .K.L.Handbook of Horticulture.ICAR.
Jature,S,J,S,J Shinde and V.S.Khandare.A Text Book of Post-Harvest Management & Value addition of Fruits and Vegetables Shri. Rajlakshmi Prakashan. Aurangabad.

SFF 203 Soil Fertility, Fertilizers and Nutrient Management 2 (1+1)

Objective: To provide detailed information on essentiality and available forms of nutrients in soils, types of fertilizers of different chemical properties and their essential nutrient content and forms.

Course outcome: Upon completion of the course students will be able to;

- Explain the criteria of essentiality and available forms of nutrients in soils.
- List types of fertilizers and classify them in terms of nutrient source.
- List factors affecting their transformation in soils and availability
- Explain methods soil analysis for nutrient contents and fertilizer recommendations.
- List fertilizer application methods and explain nutrient use efficiency.

Theory

Soil as a medium for plant growth, soil fertility and productivity, methods of soil evaluation. Essential plant nutrients, macro and micronutrients and its role. Mechanism of nutrient uptake. Problematic soils: Saline, saline-sodic, sodic-acid soils and calcareous soils and their reclamation. Organic manures: FYM, compost, vermi compost, green manuring and its preparation, concentration, organic manure, biogas slurry, sewage and slugs, agro-industrial and urban wastes. Role of organic manures in soil fertility, organic and natural farming. Fertilizers-NPK fertilizers, classification, properties, reaction in soils. Mixed, complex and compound fertilizers. Fertigation, slow release fertilizers, bio-fertilizers. Fertilizer management: Use efficiency, handling and storage. Integrated nutrient management: Concepts, components, sources and utility, INM in relation to fertilizer use efficiency. Soil pollution by agricultural chemicals and sewage water.

Practical:

Determination of soil organic carbon, calcium carbonate, available soil NPK. DTPA extractable micronutrients and fertilizer recommendation; Plant analysis, plant tissue testing. Analysis of organic manures: Organic carbon, total NPK, DTPA extractable micro-nutrient and C: N ratio. Fertilizer analysis: Urea, ammonium sulphate, potassium nitrate, murate of potash, super phosphate, rock phosphate, mix fertilizer and compound fertilizer

Suggested readings:

Kanwar, J. S. Soil Fertility-Theory and Practice. Published by ICAR, New Delhi.

Tisdale, S.L., W.L. Nelson, J.D. Beaton and J.L. Havlin. Soil Fertility and Fertilizers. Published by Prentice - Hall of India, Ltd., New Delhi.

Brady, N. C. and Ray R. Well. The Nature and Properties of Soils. Pearson Education (Singapore) Pvt. Ltd. Indian Branch, 482 F.I.E., New Delhi.

Purohit, S.S. and Dushyant Gehlot. Trends in Organic Farming in India. AGROBIOS. Agro House, Behind Nasrani Cinema, Chopasani Road, Jodhapur.

Acharya, C.L., P.K. Ghosh and A. Subba Rao. Indigenous Nutrient Management Practices-Wisdom alive in India – 2001. Indian Institute of Soil Science, Nabi bagh, Berasia Road, Bhopal.

More, S.D., K.G. Kachhave, A.S. Dhawan and V.D. Patil. Organic Farming, Issues and Strategies. Atul Book Agency, Pune

PAT 203

Post-Harvest Technology of Agricultural crops 2 (1+1)

Objective: Provides knowledge on causes of post-harvest losses in field crops and how different post-harvest management practices help to increase shelf life with preparation of different processed products.

Course outcome: Upon completion of the course students will be able to;

- Know about maturity indices, harvesting stages of different agricultural crops.
- Explain different factors responsible for deterioration of agricultural produce.
- Know about different post-harvest treatments of agricultural crops to reduce post-harvest losses.
- Explain different storage, packaging and transportation methods.
- Prepare different post-harvest products from agricultural crops and know about their quality standards and control.

Theory

Importance of Post-harvest technology. Problems occurring in harvesting, threshing, transport drying, milling and marketing. Moisture content and its measurement. Drying and its importance: Methods of drying grains. Thin layer and deep bed drying (excluding mathematical expression). Equilibrium moisture content (excluding mathematical expression). Grain dryers. Food grain storage structures. Bulk storage structures. Unit operations in seed processing. Equipment for cleaning, sorting, grading and separation. Milling, Screen analysis, Principles of size reduction, size reduction machinery, Paddy Rice processing (Excluding mathematical expression and numerical), Technology of parboiling of paddy, advantages, disadvantages of parboiling, methods of parboiling. Oil expression and extraction. Screw and hydraulic methods. Material handling equipment (excluding design), Principles of refrigeration, and cold storage.

Practical:

Study of different moisture measuring methods, Determination of grain moisture content and numerical, Study of Sieve analysis and Fineness Modulus & numerical, Study of various types of grain dryers, Study of cleaning equipment, Study of different types of separators., Study of material handling equipment, Study of modern rice milling machineries, Study of pulse milling (Flow charts of wet milling and dry milling of pulses), Study of vapour compression system of refrigeration, Study of cold storage, Study of mechanical expression devices (Hydraulic press and screw press) & Visit to seed processing plant / cold storage unit / oil mill / dal mill / rice mill.

Suggested readings:

K. M. Sahay and K. K. Singh Unit Operations of Agricultural Processing. Vikas Publishing House Pvt. Ltd., New Delhi.
A. M. Michael & T. P. Ojha. Principles of Agricultural Engineering Vol. I, Farm Power & Machinery, Farm Buildings and Postharvest technology. Jain Brothers., Jodhapur.

Chakravarty Post Harvest Technology of Cereals, Pulses and Oilseeds.. Oxford

IBH, Publishing Com. Pvt. Ltd., New Delhi.

G.A. Henderson and R.C. Perry Agricultural Processing Engineering. AVI

Co. West-Port, Connecticut, USA.

C.W. Hall. Mohan Makhijani Drying Farm Crops. at Rekha Printers, New Delhi.

Sawant B.P., Potekar J. M. and H. W. Awari. A text book of Greenhouse and Post-Harvest Technology. Nikita Publication, Latur

CSP 203 Communication Skills and Personality Development 2 (1+1)

Objective: In this course students will learn about the concept, meaning and process of communication and various methods. Students will also learn various communication skills and about personality development

Course outcome: Upon completion of the course students will be able to learn about;

- Explain various communication methods and communication skills
- Ability to write technical articles
- Understand the various personality traits
- Acquired skills to organize different seminars and conferences

Theory

Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical:

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.

Suggested readings:

Ray G.L. Extension Communication and Management, Kalyani Publishers, Ludhiana.

A.K. Singh, Lakhan Singh and R. Roy Burman. Dimensions of Agricultural Extension, Aman Publishing House, Meerut.
Sagar Mondal. Textbook on Rural Sociology and Educational Psychology, Kalyani Publishers, Ludhiana.

PET 203 Principles of Economic Theory 3 (2+1)

Objective: To provide insights on the theory and principles of economics involved in agri-produce distribution system.

Course outcome: Upon completion of the course students will be able to;

- Able to explain the demand and supply system.
- Able to analyze the market equilibrium, elasticity, competition pattern across the markets.

- Comprehensively examine business policies linked to economics.

Theory

Nature and significance of Micro and Macro-Economics. Utility function: Marginal Utility Analysis, Indifference curve; Budget line, Marginal rate of substitution, Consumer's equilibrium. Theory of demand and supply. Elasticity's of demand and supply. Theory of the Firm-Equilibrium of the firm and industry under perfect competition, monopoly and monopolistic competition. Circular flow of income. National income estimation, concepts of national income and GNP deflator. Consumption, savings and investment functions. Concept of Multiplier. Business cycles-policies for economic stabilization.

Practical:

Law of Diminishing Marginal Utility; Derivation of Budget line and Indifference curves; Consumers 'equilibrium; Law of Demand; Law of Supply; Market Equilibrium; Elasticity of Demand and Supply; Production Function-in the case of Single Variable input and two variable input condition; Cost Function; Revenue Function; Price and output determination under perfect competition; Price and output determination under monopoly; Price and output determination under monopolistic competition; Preparation of National Income Accounts; Derivation of Aggregate demand and Aggregate supply curves; Calculation of multiplier.

Suggested readings:

Dewett K. K., M. H. Navalur. Modern Economic Theory, S. Chand Publication, New Delhi.
 M. L. Seth. Principles of Economics, Lakshmi Narain Agarwal Educational Publishers, Agra.
 Dewett K.K., J. D. Verma. Elementary Economic theory, S. Chand Publication, New Delhi.
 S. Subba Reddy Agricultural Economics, Oxford and IBH Publ. Co. Pvt. Ltd

PMM 203 Principles of Marketing Management 2 (1+1)

Objective: To instill the knowledge on management of various market types and their core principles of functioning.

Course outcome: Upon completion of the course students will be able to;

- Able to understand the strategies involved market management.
- Comprehensively gain knowledge on the branding, managing services, price control and satisfaction survey.

Theory

Understanding Marketing Management, Marketing concept, Marketing mix, Market segmentation and Market targeting. Building consumers satisfaction, value and retention. Managing the marketing process and market planning. **Development of marketing strategies:** Positioning and differentiating the market offering through the product life cycle. Developing new market offerings. Designing global market offerings. **Shaping the market offerings:** Setting the product and brand strategy. Designing and Managing Services. Developing price strategies and program.

Practical:

Case Studies on marketing strategies of different agro-based products. Case Studies on "Managing the Product Life Cycle". Study on different marketing activities carried out by different Companies.

Suggested readings:

Acharya, S. S. And N.L. Agrawal. Agricultural marketing in India. Oxford and IBH publishing co. Ltd., 66, Janpath, New Delhi- 110 001.
 Kotler Philip et al. Marketing management. Pearson Education, Delhi. The Law State College Press, Ames, Iowa, USA 13th edition

Ramaswamy, V. S. And S. Namakumari. Marketing management – planning, Implementation and control. Macmillan co. 866, Third Avenue, New-York – 10022. Fifth edition.

Rajan Ssaxena, marketing management. Tata McGraw-hill publication company ltd. New dehli

Mukeshpandey, Deepali Tewari, the agribusiness book, idbc publishers Luckhnow 226 001 u. P. India. First edition.

MTA 203 Markets and Trade Acts 2 (2+0)

Objective: To provide exposure to various trade acts involved in marketing of agri-produce.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on market legislation and regulation of markets.
- Gained comprehensive knowledge on various market acts operational at national and regional level.
- Gained knowledge on export-import policies under various trade acts.

Theory

Evolution of market legislation. Procedures, need and scope for market legislation. Regulation of market. Growth and development of regulated markets. Review of Agricultural Produce Market Acts in Odisha and India. Regulated Market Act, 1937, Organization of regulated markets, constitution of market committee, finance of the market committee, functions of market committee. Agriculture Produce (Grading and Marketing) Act- 1937.AGMARK, Cold Storage Order- 1964, Cold Storage- 1980. HACCP, FSSAI and FSSA 2006 & 2011, Prevention of Food /Adulteration Act-1954. All India Rural Credit Survey Committee Reports - 1954, Odisha Agricultural Produce Marketing (Regulation) Act -1963 and New Marketing Model Acts, Consumer Protection Act-1986. Central Warehousing Corporation Act- 1957.National Co-operative Warehousing Board Act -1956.State Warehousing Corporation Act - 1958.Weighing and Measurement Act. Current Export- Import Policy

Suggested readings:

Acharya, S. S. and N. L. Agrawal. Agricultural marketing in India. Oxford and IBH Publishing, New Delhi
Mamoria, C. B. and R.L. Joshi. Principles and practices of marketing In India. KitabMahal, 15, thorn hill road, Allahabad.

Panvar, J. S. Beyond consumer marketing. Response books sage publications, New Delhi

Rajan Nijhawan, Food safety and standards act 2006, rules 2011, regulations 2011. International law Book Company, church road, kashmere gate, Delhi. 12th edition.

S. Subbareddy, P. Raghu ram, Agricultural economics, oxford and IBH publishing company Pvt. Ltd. 2004

AGI 203 Agri-Informatics 2 (1+1)

Objective: To provide exposure to the computer based MIS and data relevant to agriculture and interactive software's.

Course outcome: Upon completion of the course students will be able to;

- Explain importance of ICT in agriculture.
- Use of agriculture related database to develop analytics.
- Develop interactive apps. to provide services.
- Develop decision making process to support agricultural activities.
- Develop database of all aspects of agriculture.

Theory

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System, definition and types, Applications of MS-Office for creating, Editing and Formatting a document, Data presentation, tabulation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, creating database, uses

of DBMS in Agriculture, Internet and World Wide Web (WWW), Concepts, components and creation of web, HTML, XML coding.

Computer Programming, General Concepts, Documentation and Program Maintenance, Debugging programs, Errors. Introduction to Visual Basic, Java, Fortran, C/ C++, etc., concepts and standard input/output operations, Variables and Constants, Operators and Expressions, Flow of control, Inbuilt and User defined functions, programming techniques for agriculture. e-Agriculture, concepts, design and development. Application of innovative ways to use information and communication technologies (IT) in Agriculture. ICT for Data Collection, formation of development program, monitoring and evaluation of Programmers. Computer Models in Agriculture: statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone mobile apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology, concepts, techniques, components and uses for generating valuable agri-information. Decision support systems, taxonomy, components, framework, classification and applications in Agriculture, DSS, Agriculture Information/Expert System, Soil Information Systems etc. for supporting Farm decisions. Preparation of contingent crop-planning and crop calendars using IT tools.

Practical:

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix, Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power point for creating, editing and presenting a scientific Document, Handling of Tabular data, animation, video tools, art tool, graphics, template & designs. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, handling macros. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW) and its components, creation of scientific website, presentation and management agricultural information through web. Introduction of various programming languages such as Visual Basic, Java, Fortran, C, C++, and their components Hands on practice on writing small program. Hands on practice on Crop Simulation Models (CSM), DSSAT/Crop-Info/Crop Syst/Wofost. Preparation of Inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools. Use of smart phones and other devices in agro-advisory and dissemination of market information. Introduction of Geospatial Technology, demonstration of generating information important for Agriculture. Hands on practice on preparation of Decision Support System.

Suggested readings:

Pradeep K. Sinha and PritiSinha Computer Fundamentals, III edition, BPB Publications, B-14, Connaught Place, New Delhi – 110 001.

P.K. Sinha Computer Fundamentals, BPB Publications, B-14, Connaught Place, New Delhi – 110 001.

Mastering Office Professional for window 95, BPB Publications, B-14, Connaught Place, New Delhi – 110 001.

Statistical Methods for Agricultural workers by V.G. Panse and P.V. Sukhatma, ICAR, New Delhi.

http://www.tutorialsforopenoffice.org/category_index/base.html

<http://www.nrsc.gov.in/Agriculture>

<http://iasri.res.in/>

<http://mkisan.gov.in/downloadmobileapps.aspx>

<http://communicationtheory.org/berlos-smcr-model-of-communication>

HRD 203 Human Resource Management and Development 3 (2+1)

Objective: To provide broad exposure on skilled human resource management, wage control and grievances resolution.

Course outcome: Upon completion of the course students will be able to;

- Able identify and classify skilled human resources to suit the job requirement.
- Able to fix the salary structure and benefits as per the qualifications with subsequent appraisal for promotion.
- Gained knowledge on program for development of human resources, dispute resolving, wage control, employee benefits/services administration and incentive schemes etc.

Theory

Human Resources Management: Definition, Nature, Scope and objectives of HRM, Difference between HRM and PM, Importance of HRM, The changing environment of HRM, The changing role of HRM. **HRP / Manpower Planning:** Definition, Need HRP, Career Planning and Succession Planning. **Job Analysis:** Job Terminology, Process of Job Analysis, Job Description, Job Specification. **Human Resource Acquisition:** Meaning, Sources, and Process of Recruitment, Meaning, Process Test of Selection, Meaning, Objectives and Types of Interview, Meaning, Purpose, Process and Problems of Induction, Meaning and Problems of Placement. **Training and Development:** Meaning, Benefits and Process of Training, Methods and Problems of Training, Career Development, Meaning and Techniques of Executive Development, **Performance Appraisal:** Nature, Objectives and Methods of Performance Appraisal, Meaning and Types of Promotion, Meaning and Types of Transfers, Meaning of Demotion, Separation, Suspension, Redundancy, Retrenchment, Lay Off, (Meaning only) **Wage and Salary Administration:** Nature and Purpose, Compensation, Reward, Wage levels and Wage Structures, Minimum, Fair and Living Wage, Basic Kinds of Wage Plan, Ingredients of a Good Wage Plan, Types of Wages, Wage Differentials, Executive Compensation. **Rewards and Incentives:** Meaning and Features, Types of Rewards, Wage Incentives – Meaning and Objectives **Employee Benefits and Service:** Terminology and Meaning, Special Features of Fringe Benefits, Objectives & Classification of Fringe Benefit **Management of Grievances:** Meaning, Causes and Needs of Grievance Procedure. **Industrial Relations:** Definition, Objectives and Participants in Industrial Relations **Resolving Disputes:** Meaning, Causes & Settlement of Disputes, Method of Disputes Settlement (Meaning Only).

Practical:

Case Study on Human Resource Management, Case Study on Job Analysis, Job Description & Job Specification, Case Study on Manpower Planning, Case Study on Recruitment, Case Study on Selection, Case Study on Induction, Case Study on Training, Case Study on Management Development, Case Study on Performance Appraisal, Case Study on Employee Compensation, Case Study on Employee Benefits, Case Study on Rewards and Incentives, Case Study on Grievances Management.

Suggested readings:

K. Ashwathappa- Human Resource and Personnel Management- Tata McGraw Hill Publishing Co. Ltd.
 C. B. Mamoria and S. V. Gankar Personnel Management Text & Cases
 Performance Appraisal, Theory & Practice- AIMA- Vikas Management Series, New Delhi- 1986.
 Dr. Anjali Ghanekar Human Resource Management.
 Dr. C. B. Gupta- Sultan and Sons Human Resource Management.

IWM 204 Irrigation Water Management 2 (1+1)

Objective: To provide broader exposure on water resources management in agriculture sector

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on water resources and methods of conservation.
- Gained knowledge on various irrigation methods and their advantages and disadvantages.
- Ability to comprehensively examine the irrigation technologies and their suitability.

Theory

Water resource development and utilization in India, Importance of irrigation, Soil water plant relationship, measurement of soil moisture, irrigation water, infiltration. Water requirement of important crops, Consumptive use and evapotranspiration, different irrigation efficiencies. **Irrigation methods:** border, check basin, furrow, sprinkler and drip irrigation. **Sprinkler irrigation:** types, components, design and layout and care and maintenance. **Drip irrigation:** Types, components, design and layout and care and maintenance. Fertigation and filtration aspects of micro-irrigation. Introduction to other pressurized irrigation system, rain gun, porous pipe etc.

Practical:

Determination of soil moisture by gravimetric method, Measurement of irrigation water by weirs, orifice and flumes, Measurement of infiltration and analysis of infiltration rate, Estimation of water requirement by different methods, Study of different components of drip irrigation system, Fertigation through different devices, Study of different components of sprinkler irrigation system, Estimation of irrigation efficiencies, Cost economics of

drip/sprinkler system and other pressurized irrigation systems, Care and maintenance of micro-irrigation system, Study of different filtration system, Visit to different pressurized irrigation system manufacturers.

Suggested readings:

Michael, A.M. Irrigation: Theory and Practice. Vikas Publishing House Pvt. Ltd., Delhi.
Murthy, V. V. N. Land and Water Management. Kalyani Publishers, Ludhiana.
Michael, A.M. and T.P. Ojha. Principles of Agricultural Engineering. Vol. II, Jain Brothers, Jodhpur.
Shivnappan, R.K. Sprinkler Irrigation. Oxford IBM Publishing Co. Pvt.Ltd., New Delhi.
Shivnappan, R. K. Drip Irrigation. Keerti Publishers House, Trivandrum.
Radhey Lal. Irrigation Hydraulics. Saroj Prakashan, Allahabad.

FPM 204 Farm power and Machinery 2 (1+1)

Objective: Discussed detailed knowledge on various farm machineries and their functioning principles.

Course outcome: Upon completion of the course students will be able to;

- List types of farm machineries and their working principles.
- Ability to repair and trouble-shooting of machineries
- Identify suitable tillage equipment's to be used with power operated machines.
- Computational ability for cost analysis of power usage in land preparation.

Theory:

Farm power in India: Sources. Scope of mechanization. I.C. engines, working principles, two stroke and four stroke engines. I.C. engine terminology, Components of I.C. Engine, different systems of I.C. engine. Tractors. Types, Selection of tractor and cost of tractor power. Tillage implements. Primary and secondary tillage implements, Implements for intercultural operations seed drill, paddy transplanters, plant protection equipment and harvesting equipment: Equipment for land development and soil conservation.

Practical's:

Study of different components of I.C. Engine; Study of working of two stroke engine: Study of M. B. plough, Study of disc plough: Study of seed-cum-fertilizer drills-furrow opener, metering mechanism, and calibration; Study, maintenance and operation of tractor: Learning of tractor driving: Study, maintenance and operation of power tiller, study of different inter cultivation equipment in terms of efficiency, field capacity; Repairs and adjustments and operation of sprayers; Repairs and adjustments and operation of dusters; Study of paddy transplanters.

Suggested Readings:

Elements of Agricultural Engineering. Dr. Jagadishwar Sahay. Forth Edition, 2004.
Principles of Agricultural Engineering. Vol-I. T. P. Ojha and A. M. Michael. Jail Brothers, New Delhi.
Farm Tractor –Repair and Maintenance by S.C. Jain and C.R. Rai.
Elements of Farm Machinery. A. C. Shrivastava. Oxford & IBH Publishing. Farm Machinery and Equipment. Smith and Wilkes.

SMB 204 Statistical Methods in Business 3 (1+2)

Objective: To understand the types of data, basic methods used in data analysis and computer based software's used in data collection, management and interpretation of data.

Course outcome: Upon completion of the course students will be able to;

- Explain the data and data classification.
- Organize data in excel sheet for analysis and interpretation using various statistical methods.
- Perform sampling, data collection and analysis to apply test of significance.
- Develop field scale testing design and collect the primary empirical data.

- Use of computer based statistical software to analyze a set of data.

Theory

Definition of statistics, meaning, scope, statistics and industry, its applications, uses and misuses of statistics in business. Frequency distribution, raw data, the array frequency distribution, determining classes and class interval, cumulative frequency distribution. Graphic presentation of data. Measures of central tendency, AM, Median, Mode, GM, HM for grouped and ungrouped data. Characteristics of mean, mode and median, weighted mean their uses and applications. Dispersion, Range, Mean Deviation, Variance, Standard Deviation, Properties of SD, relative measures of dispersion for grouped and ungrouped data, Skewness, Kurtosis and moments. Probability and probability distribution. Definition of probability, mathematical probability. Empirical probability and axiomatic approach. Events, sample space, probability of independent and dependent events. Generalization and extensions of the law of probability formula. Discrete probability distribution. Binomial and Poisson distribution and its parameters. Normal distribution, its properties and procedure of fitting the normal curve. Tests of hypothesis-two-sided test, one sided test, confidence limit. Critical region, power of a statistical test. Study of student's 't' distribution. One sample, two sample 't' test. 'F'-test, χ^2 test, uses and applications. Study of simple correlation and regression. Scatter diagram. The least-square criteria for fitting simple regression. Tests of hypothesis for slope and correlation coefficient. The standard errors of estimates. Multiple and partial correlation, multiple regression up to three variables. The normal equation with least squares estimates. The matrix theory approach in solving the normal equations and testing the significance of partial regression coefficients. Coefficient of multiple determination and its significance. Time series and index number analysis.

Practical:

Classification of data (problems on exclusive and inclusive classification) Computation of AM, GM, HM, Median, Mode for discrete ungrouped data & grouped data. Computation of AM, GM, HM, Median and Mode for continuous series The estimation of measures of dispersion, range, mean deviation from averages, variance, standard deviation, standard error and relative measures such as CV, coefficient of MD. The computation of range, MD, variance, standard deviation, standard error and CV coefficient of MD for grouped data. Students test for one sample, paired 't' test and unpaired 't' test and 'F'-test. Computation of χ^2 for one sample 2 x 2 and n x k contingency table. Calculation of correlation coefficient and regression coefficient. $Y = a + bx$, $X = a^1 + b^1y$ and testing significance of r and b. Computation of three variable multiple linear regression equation by using matrix inverse and testing significance of partial regression coefficient and R^2 . Fitting of Binomial and Normal distribution. Fitting of linear, semi-log parabolic trend equations to time series data. Fitting of modified exponential, Gompertz, and Logistic growth curve. Seasonal variations-By methods of simple averages and ratio to moving average method. Seasonal variations by ratio to trend method and method of link relatives. Measurement of cyclic and irregular variation. Construction of Index Numbers. Procedure of base shifting, deflation of indices.

Suggested readings:

Croxton, F. E., D.J. Cowden and Ben, W. Bolch. Practical Business Statistics. Prentice Hall of India Pvt. Ltd. Publication.
Gupta, S.C. Fundamentals of Statistics. Himalaya Publishing House.
Gupta, S.C and V.K. Kapoor. Fundamentals of Mathematical Statistics. Sultan Chand and Sons, New Delhi- 110 002

CPB 204 Consumer Psychology in Business Management 2 (1+1)

Objective: To provide exposure on strategies involved in profiling the consumer psychology while building a business.

Course outcome: Upon completion of the course students will be able to;

- Gained comprehensive knowledge on the psychology, perception of consumers, attitudinal changes involved while making a decision on buying a product.
- Ability to develop strategies to influence the buyer through emotional tactics of marketing, consumer spending abilities, social class affecting buying behaviour.
- Able understand how product positioning is linked to consumer psychology.

Theory

Psychology: Concept, Meaning, definitions, scope and importance. **Perception:** Meaning, definitions, determinants of perceptions, general principles, errors in perceptions. **Attitude:** Meaning and characteristics, formation of

stereotypes and prejudices, factors in attitude change. **Consumer buying:** The decision making process. Consumer information processing, consumer learning process. **Consumer preferences:** Post-purchase processes, situational influence. Social classes and buying behaviour. **Emotion:** Concept, meaning, definition, motivation and emotion, type of emotion, theories of emotion, expressive components of emotions. **Learning:** Definition, principles, indicators theories of learning and experimental learning, factor affecting learning. **Consumer spending:** Consumer spending and savings, consumer behaviour and the marketing manager, product positioning, marketing mix development.

Practical:

General Household surveys for consumer's preferences, to work out the income and expenditure pattern of consumers. Market survey visit and collect the relevant factors and information, market survey of commodity choices to study the different types of market operation in area & function, Visit to Agri mall or shop.

Suggested readings:

Atwater F. Psychology for leaving, Adjustment, Growth and Behaviour Today. Prentice Hall of India, New Delhi.
Back C. Robert. Psychological factors at work, Recognition and control ILO, Geneva, Occupational Safety and Health Series No.56.
Back C. Robert. Apply Psychology Understanding People. Prentice Hall Engle woods Cliffs, New Jersey.
Baron, R.A. Psychology. Prentice Hall of India, New Delhi.
Chakraborty, Ajitha. Social stress Mental Health, A Social Psychiatric field study of Calcutta. SAGE Publication, New Delhi.
Chattopadhyaya, Aparna. What's your emotional IQ. Pustak Mahal, New Delhi.
Davar, Bhargavir and Parmeshvar Bhatt. Psychology analysis as a human science beyond fundamentalism. Sage Publication, New Delhi.
Morgan, C.T. Klng, R.a. Robinson, N.M. Introduction to psychology – Tata McGraw Hill Publishing Co., New Delhi.
Hans Raj Bhatia. A Textbook Educational Psychology.
Rogers, Evertt M. Diffusion of Innovations, New York The Free Press.
Shiffman, L.G. and L.L. Kaunk. Consumer Behaviour. Prentice-Hall of India Pvt. Ltd., M-97, Connaught Circle, New Delhi. 110 001.

ACM 204 Agricultural Cooperation, Institutions and Management 3 (2+1)

Objective: To provide broader knowledge on the agriculture cooperative systems and functioning of the institutions.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on various agri-based cooperatives operational in rural India.
- Gained the knowledge on functioning and management.
- Gained knowledge on various types of cooperative linked to agriculture management.
- Comprehensively differentiate between cooperatives involved in marketing of various agri-produce.

Theory

Co-operation: Meaning, Definition, principles of co-operation and its application in agriculture. Importance and role of co-operation in agriculture and rural development. Co-operation compared with capitalism, socialism, communism and co-operative movement in India.

Co-operative marketing and Processing Institutions: Institutional, non-institutional and multi-agency approach, forms of co-operative, Co-operative education and training. State co-operative Union and NCDC, co-operative administration and HRM. **Co-operative Management:** Nature and Functions, professional Management of Co-operatives, role of leadership in co-operative Management.

Practical:

To study of primary Agricultural Co-operative Credit society, District Central Co-operative bank, state Co-operative bank, M.S. Co-operative Bank for Agricultural and Rural development. Forms of Co-operatives. Procedure for obtaining loans. Formulation of loan proposal. Economic feasibility of a farm credit proposal. Study of co-operative Marketing, Study of processing of cereals, pulses and oilseeds managed by co-operatives, study of NCDC. Preparation of loan proposal for horticultural garden, visit to different cooperative credit institutions, visit to agribusiness cooperatives, Problems in cooperatives and remedies to overcome the same.

Suggested readings:

Umesh C. Patnaik and Ananta K. Roy. Co-operation and Co-operative Management. Kalyani publishers, Ludhiana-141 008.
G.R. Madan. Co-operative Movement in India. Mittal Publications, Daryaganj, New Delhi-110 002.
Sarkar A.N. Agri Business Co-operative Management. Everest Publishing House, Everest Lane, 536, Shaniwar Peth, Appa Balwant Chowk, Pune – 411 030.
R.R.Paul. Money, Banking and International Trade. Kalyani Publishers, Rajinder Nagar, Ludhiana-141 008.
M.L.Jhingan. Money, Banking, International Trade and Public Finance.
Vrinda Publications(P) Ltd. B-5, Ashish Complex (Opp. Ahlcon Public School), Mayur Vihar, Phase –I, Delhi-110 091.
Mamoria, C.B. and R.D. Saxena. Co-operation in India, Kitab mahal, 15-Thorn Hill Road, Allahabad.
Joshi, S.S and Charles V. Moore. Essentials of Farm Financial Management. Today and Tomorrow's printed and Publishers-22 B-5, Original Road, Karol Bagh, New Delhi- 110005.
S.B.Verma, G.P.Sah, S.C.Pathak. Rural credit and Co-operative Development. Deep & Deep Publications Pvt. Ltd. F-159, Rajouri Garden, New Delhi-110027.
Dr.V.D.Varkey, V.G.Vartak. Co-operative Management. Pragati Books Pvt.Ltd. 119, Budhwar Peth, Jogeshwari Mandir Lane, Pune-411002.

RMI 204 Rural Marketing and Market Infrastructure 3 (2+1)

Objective: To introduce to various rural based market mechanisms and their characteristics

Course outcome: Upon completion of the course students will be able to;

- Gained comprehensive knowledge on the rural market instruments and functioning.
- Gained knowledge on the product processing, quality control and pricing.
- Ability to design a questionnaire to study the factors affecting the rural market, problems and institutional needs.

Theory

Profile of rural marketing, definition, classification, strategies, characteristics, changing pattern of rural market, problems in rural marketing. Rural marketing in India – Difference between urban and rural market, study of rural resources. Rural marketing and research– Sources for conducting marketing research, dos and don'ts for rural marketing and rural industries. Rural segmentation- Targeting and positioning. Rural product and prices– Introduction, packing, pricing methods, rural branding. Rural distribution/channels of distribution, functions of rural sales persons. Rural communication– Introduction, types, factors affecting rural communication, problems. Market infrastructure– Meaning, facilities included and its importance.

Practical:

Visits to various rural markets including daily, weekly bazaars etc. and their complete profile studies. Studies of market infrastructure such as market yard, grading and methods of sale Case study on Rural marketing.

Suggested readings:

Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India. Oxford and IBH publishing company Pvt. Ltd. 66, Janpath, New Delhi – 1.
Memoria, C.B. and R.L. Joshi. Principles and Practice of Marketing in India". Kitab Mahal, 15, Thorn hill Road, Allahabad. Ramtishen, Y. Rural and Agricultural Marketing. VES College of Arts, Science and Commerce, Mumbai. Jacob Publishing House.

IMM 204 Input Marketing Management 2 (1+1)

Objective: To provide broader knowledge on the agri-input management and their market mechanism.

Course outcome: Upon completion of the course students will be able to;

- Able identify the source of various agri-inputs.
- Gained knowledge on the organizations involved in production and distribution of agri-inputs and their brands.
- Gained knowledge on credit based purchase mechanisms.

Theory

Scope and importance of agricultural input marketing management. Study of demand and supply scenario of major agro-inputs: seeds, fertilizers, agro-chemicals, farm machineries and electricity. Production organizations in seeds, fertilizers, agro-chemicals. Various types of Credit for procurement of inputs. Study of Marketing of various inputs, various Marketing channels, problems in marketing and suggestion to overcome the problems. Branding and packaging for major agro-inputs

Practical:

Visit to seed organizations – Study of production, pricing, transportation and promotion of seeds. Study of Chemical fertilizer production Units. Public sector, Co-operative Sector, Private Sector Companies and their products range. Study of Demand and Supply of chemical fertilizers and gap therein. Types of agro-chemicals used as agricultural inputs. Visit to Agricultural Exhibition. Role of Agricultural exhibitions in marketing of Agro-inputs. Market survey of local market to know potentiality of different crop seeds, fertilizers, various plant protection chemicals and farm machineries

Suggested readings:

Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India. Oxford and IBH Publishing Company Pvt. Ltd., 66, Janpath, New Delhi – 1. Memoria, C.B. and R.L. Joshi. Principles and Practice of Marketing in India. Kitab Mahal, 15, Thorn hill Road, Allahabad

OPA 204 Office Procedures for Agribusiness 1 (0+1)

Objective: To provide pragmatic exposure on office establishment for agribusiness activities.

Course outcome: Upon completion of the course students will be able to;

- Able to catalogue the office needs and set up a functional office.
- Gained knowledge on maintaining various office documents, purchase orders, quotation preparation etc.
- Able organize office files of various types.
- Gained knowledge on drafting letter for government agencies etc.

Practical

Office documents, drafting (Letter, demi-official, purchase, enquiry, quotations, purchase orders, queries and replies), payments, billing and preliminary requirements, files, filing system and indexing, report and publication procedure, Government and private offices. Study of these offices and their functioning.

Suggested readings:

Civil Service Rules, Government of Odisha. Orissa Agricultural Universities Account Code.

Accounts books prescribed for post-recruitment examination of State Government.

Bhalla, V.K. Invest Management (Security and portfolio Management). S. Chand and Co., Ltd., 7361, Ram Nagar, Qutab Road, New Delhi-110 055. Pillai, R.S.N. and Bagavati. Office Management. S. Chand and Co., Ltd., 7361, Ram Nagar, Qutab Road, New Delhi-110 055

OBB 204 Organizational Behaviour of Business Management 2 (2+0)

Objective: To create awareness on the behavioural traits of various office personnel and organization as an entity.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on traits of behavior of management at various strata.
- Gained knowledge on team building qualities and motivational tasks.
- Acquired the critical knowledge on leadership qualities and negotiator skills.
- Gained knowledge on the social groups and the behavior components of an organization.

Theory

Organization and its analysis: Nature of organization, scope and significance of Organizational Behaviour, relevance of Organizational Behaviour in today's business environment. **Personality and Motivation:** Objectives, Introduction, Meaning, Personality determinants, Personality traits. **Motivation:** Types, Characteristics, Theories of Motivation-Early theories and Contemporary theories. Motivation at different levels. How to motivate subordinates. **Social Groups-** meaning, definition, classification, factors considered in formation of organization. Motivation in group formation. **Social organizations-** meaning, definition, types of organization. **Team Building:** Introduction, Systematic Approach, Information stage, reviewing in order to improve, analyzing skills, Feedback of observations, Supportive development building on ideas, Contributions in a group, Degrees of Agreement, Aspirations. **Leadership Development:** Understanding leadership, Theories of leadership-Trait theory, contingency theory, Situational leadership theory, Organizational theory, Power theory, Ethical Assessment theory, and Transactional or Transformational leadership. **Negotiation Skills:** Negotiation, simple Negotiation Model, Guidelines on negotiation, Positional bargaining, Positions and Interests.

Suggested readings:

Korman, Abraham K-Organizational Behaviour.
Khanka, S.S. - Organizational Behaviour.
Singh and Chhabra-Organizational Theory and Behaviour.
Maslow, A.H.-Motivation and Personality. Mattock, John- How to be better negotiator

Elective courses (Any 3)

Hi-tech Horticulture

Objective: Broadly introduce to the technologically advanced methods of cultivation of horticultural crops.

Course outcome: Upon completion of the course students will be able to;

- Ability to explain the cultivation of horticultural crops in polyhouse.
- Skills to source and use of precision technologies suitable for hi-tech horticulture.
- Ability to optimize the growth conditions using remotely controlled gadgets.

Theory

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods, Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding, Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical:

Types of polyhouses and shade net houses, Intercultural operations, tools and equipment identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

Suggested readings:

T. A. More, Karale A.R. and Patil M.T. 2001. Hi-tech horticulture, CAFT (Fruits) MPKV, Rahuri
Balraj Singh.2005. Protected cultivation of vegetables crops, Kalyani Publisher, New Delhi.
Patil, M. T. and Patil P.V. 2004. Commercial Protected Floriculture, MPKV, Rahuri.
Prasad and Kumar Commercial Floriculture –Proceeding of International Seminar on Protected cultivation in India, Held at Bangalore 1997.
V. Nelson.Paul.,Greenhouse operation and management-
S.D. Varale. 2003, Protected Cultivation of horticulture crops, CAFT(Fruits), MPKV, Rahuri.
Mavi, H.S. Introduction to Agro-metrology, Oxford and IBH Publishing Co., New Delhi.

ATM 501 Agro-tourism 3(1+2)

Objective: To provide broader exposure on the importance of agro-tourism as a business model.

Course outcome: Upon completion of the course students will be able to;

- Gained comprehensive knowledge on the avenues of agro-tourism and entrepreneurial skills.
- Acquainted knowledge on the components of the agro-tourism and their operational management.
- Gained skills on hospitality, services and products marketing strategies.
- Ability to develop a business model for agro-tourism.

Theory

Agro-tourism: Introduction, importance, scope, forms of agro-tourism, advantages and implementations, introduction to Indian culture. Govt. policies and legislations in respect of tourism and agro-tourism and environment protection laws. Requirements for Agro-tourism. Farm, forest, garden, fish tank/ponds, residential huts, etc. Constraints in operation and management of Agro-tourism activities. Management of resources – Human resources, Natural resources and Garbage management at Agro-tourism centre. Entrepreneurship development:

Role and functions, **Hospitality:** Food and beverages and accommodation services. **Communication skill and service;** Capital investment, sources and capital budgeting. **Project proposal-** Preparation and feasibility tests, Accounts and record keeping etc. Marketing strategies for Agro-tourism products and services. Publicity of tourism- Advertisement and use of media.

Practical

Visit to various nearby agro-tourism centers. Study of different types of Agro- tourism centers and services offered by them etc. Report on agro-tourism project.

Suggested readings:

Available recent literature ad publications, Government policies on Agro-tourism.
Talwar, Prakash Travel and Tourism Management Gyan Boks Pvt., Ltd., Ansari Road, Darya Ganj, New Delhi-110002.
Bagri, S.C. Trends in Tourism promotion 2003. International Books distributors, 9/3, Rajpur Roaad, Dehradun-248001 Uttarkhand (India).

FTP 502 Food Technology and Processing Management 3 (2+1)

Objective: To provide insight on the food processing industry, quality control regulations and available processing technologies.

Course outcome: Upon completion of the course students will be able to;

- Acquired analytical skills to examine the food industry status.
- Ability to assess risk, quality control, ISO standards and laws governing the food industry.
- List the technologies suitable for various agricultural food processing.

Theory

Present status of food industry in India, organization in food industry, Introduction to operations of food industry, Deteriorative factors and hazards during processing, storage, handling and distribution, Basic principles of food processing, food preservation by manipulation, Application of energy, radiations, chemicals and biotechnological agents, Packaging of foods, Analysis of costs in food organization, Risk management, Laws and regulations related to food industry and food production and marketing, quality management, Prevention of food adulteration, ISO standards, Case studies on project formulation, milk and dairy products, cereal milling, oil-seed and pulse milling, oil and fat processing, Case studies on sugarcane milling, honey production, baking, confectionery, Case studies on processing of fruits- fruit jam, jellies etc, Case studies on fruits and vegetable storage and handling, Case studies on vegetables processing-tomato ketchup etc., Case studies on egg, poultry, fish, meat handling and processing,

Practical:

Demonstration of various machineries used in food processing, Preservation of food by using chemicals, Preservation of food by irradiation, Food preservation by fermentation, Packaging of food by using paper boards, plastic films, tetra packs etc., Quality evaluation of raw material, Evaluation of food standards, Visit to fruit and vegetable market for quality assessment, Visit to units with ISO standard/HACCP certification, Preparation of project reports for cereal, legume, oilseed, milk & milk products, fruit and vegetable processing units.

Suggested readings:

Acharya, S. S. & Aggarwal, N. L. 2004. Agricultural Marketing in India. Oxford & IBH.
Early, R. 1995. Guide to Quality Management Systems for Food Industries. Blackie.
Jelen, P. 1985. Introduction to Food Processing. Reston Publishing.
Potly, V.H. & Mulky, M. J. 1993. Food Processing. Oxford & IBH.
Krammer A and Twigg BA. 1973. Quality Control in Food Industry, Vol. I, II, AVI Publ.
Ramaswamy H and Marcotte M. 2006. Food Processing: Principles and Applications. Taylor and Francis.
Verma L.R. and Joshi V.K. 2000. Post-Harvest Technology of Fruits and Vegetables. Indus Publ.

IPM 305 Integrated Pest Management 2 (1+1)

Objective: Provide insights on basic principles and procedure of integrated pest management.

Course outcome: Upon completion of the course students will be able to;

- Explain the various concepts, principles and tools of IPM.
- Explain the methods for detection and diagnosis of insect pests and to calculate the dynamics of economic injury level.
- Acquired ability to survey and forecast different insect pest outbreak.
- Develop and validate different modules of IPM for the control of pests.

Theory

Definition of IPM, Scope of IPM, Importance of IPM, Principles of IPM, Components/Tools of IPM-(Cultural method, Physical method, Mechanical Method, Biological method, Legal Method-Insecticide Act-1968, HPR, Chemical method, Resistant trends (NCIPM)). IPM strategies for- (Cash crops- Sugarcane, cotton. Cereals- Paddy, Wheat, Jawar, Bajra. Pulses- Pigeon pea. Oilseed crops- Groundnut, Fruits- Mango, Grapes, Pomegranate, Citrus, Banana, Vegetable

crops- Brinjal, Okra, Tomato, Chilly, Onion, Cabbage and cauliflower, Food safety standards & Pesticide residue and their management.

Practical:

Formulation of insecticides, Classification of Insecticides and hazards, Status of chemical and bio-pesticides India according to CIB Central Insecticide Board, Insecticide act, Plant protection appliances, Production of Bio-pesticides- HaNPV, SINPV & Bio-agents- *Chrysoperla*, *Cryptolaemus* and *Trichogramma*. Visit to pesticide manufactures / Agro service centre and make visit report.

1. Definition of IPM, Scope of IPM, Importance of IPM
2. Principles of IPM
3. Components/Tools of IPM-
 - i. Cultural method
 - ii. Physical method
 - iii. Mechanical Method
 - iv. Biological method
 - v. Legal Method-Insecticide Act-1968
 - vi. HPR
 - vii. Chemical method
 - viii. Resent trends (NCIPM)
4. IPM strategies for
 - i. Cash crops- Sugarcane, cotton
 - ii. Cereals- Paddy, Wheat, Jawar, Bajra
 - iii. Pulses- Pigeon pea
 - iv. Oilseed crops- Ground nut
 - v. Fruits- Mango, Grapes, Pomegranate, Citrus, Banana
 - vi. Vegetable crops- Brinjal, Okra, Tomato, Chilly, Onion, Cabbage and cauliflower
5. Food safety standards
6. Pesticide residue and their management

Practical:

1. Formulation of insecticides
2. Classification of Insecticides and hazards: Status of chemical and bio-pesticides India according to Central Insecticide Board and Insecticide act.
3. Plant protection appliances
4. Production of
 - a) Bio-pesticides- HaNPV, SINPV
 - b) Bio-agents- *Chrysoperla*, *Cryptolaemus* and *Trichogramma*
5. Visit to pesticide manufactures / Agro service centre and make visit report.

Suggested readings:

Dhaliwak, G. S. and R. Arora. Integrated Pest Management- Concepts and Approaches. Kalyani Publishers, New Delhi.
Dhaliwal G. S., Ram sing and Vikas Jindal. A text book of Integrated Pest Management, Kalyani Publishers, New Delhi
Shrivastava K. P., A Text book of Applied Entomology, Kalyani Publishers, New Delhi- Vol.1 and Vol.2
Saxena R. C. and Srivastava R. C., Entomology at a Glance, Agrotech Pub., Udaipur

Objective: To provide broader exposure to agriculture sector in the India and relevant statistics.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on the Indian agriculture, land holdings and characterizes of agricultural landscapes.
- Ability to comprehensively analyze the productivity, reasons for poor productive capacity and the drivers.
- Ability to analyze the utility of local varieties and HYV under minimal input and high input management.
- Ability study the five years plans, national planning on food security.

Theory

Indian Economy: Pattern of Agriculture Holdings, Fragmentation, Sub-Division and Consolidation of Land Holdings. Place of Agriculture in National Economy and Comparison with other Countries. Different Types of Revolutions in India. Agricultural Productivity: Trends, Causes and Consequences of Low Productivity in India. Green Revolution: Food production and consumption trends in India in the millennia, paradigm shift in agrarian economy, New Strategy in Development of Indian Agriculture, High Yielding Varieties (HYV) Program, Irrigation Development Agriculture and Farm Mechanization. Five Year Plans- Silent Features, NITI Ayog, Place of Agriculture in National Planning, Problems of Food Security.

Practical:

Indian Agriculture Scenario SWOT Analysis, All India production of Milk, Eggs, Meat, Woo, All India Fish Production (Lakh Tones), Wool & Silk Production Status, Live Stock Census, India's Agricultural Export Potential, Measures Being Adopted to Increase Production, Demographic Profile of Indian Population

Suggested readings:

Mamoria, C.B. Agricultural Problems of India. Kitab Mahal, Allahabad.
S. Subba Reddy Agricultural Economics, Oxford and IBH Publ. Co. Pvt. Ltd.
Ruddar Datta and K. P. M. Sundharam, S..Indian Economy, Chand Publications.
General Studies Indian Economy by Pratiyogita Darpan.
Website of NITI Aayog (Planning Commission).

FME 305 Farm Management and Production Economics 3 (2+1)

Objective: To provide critical exposure on farm management as a unit with definition on the characteristics of the farm.

Course outcome: Upon completion of the course students will be able to;

- Able to visualize in conceptual terms the various synergistic components of a farm.
- Ability to apply farm management concepts, visualize the balance sheet on farm economy and planning profitable farming activities.
- Able to understand the technical and equipment needs of a farm.
- Gained skills to maintain a farm record – inclusive of all the practices to profit calculations.
- Gained the procedural abilities to file for crop insurance and compensation in the event of natural disaster.

Theory

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income. Farm

business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/ livestock/ machinery insurance – weather based crop insurance, features, determinants of compensation.

Practical:

Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs uses in a farm production process. Determination of least cost combination of inputs. Selection of most profitable enterprise combination. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts.

Suggested readings:

Dhondyal, S. P. Farm Management: An Economic Analysis. Friends Publications, 90, Krisnapur, Meerut – 250 002.
Johl, S.S and T.R Kapur. Fundamentals of Farm Business Management. Usha Raj Jumar for Kalyani Publishers, 11 Rajendar Nagar, Ludhiana – 114 008,
Singh, I.J. Elements of Farm Management Economics. Affiliated East West Press (Pvt.) Ltd., New Delhi.
Kahlon, A.S and Karam Singh. Economics of Farm Management in India: Theory and Practice. Allied Publishers (Pvt) Ltd, 15 J.N. Heredia Marg, Ballard Estate, Mumbai- 400

PPM 305

Product Promotion Methods 2 (1+1)

Objective: To provide exposure to strategies involved in product promotion and marketing.

Course outcome: Upon completion of the course students will be able to;

- Acquainted with the product promotion methods and policies.
- Able develop strategies for advertising and building market for a product.
- Gained ability to develop framework for international marketing of a product.

Theory

Product Promotion: Meaning and importance, pricing, promotional policies and practices. Market communication.
Planning: Planning in marketing managerial process, steps and strategic options. Product differentiation and product positioning. **Product Marketing:** Market segmentation of consumer and industrial markets, selecting and promoting target markets. **Product-mix:** meaning, classification, life cycle and components. Marketing channels- Meaning, push and pull strategies. Promotion skills of wholesalers and retailers. **Product Pricing:** Definition, price-mix, pricing strategies and communicating prices. Psychology of human behaviour in product promotion - culture and sub-culture, values of consumer behaviour, social groups. Organizational buying, message-source, structure, varieties and contents etc. **Advertising:** History, definition, classification, function and organization of advertising campaign. Elements, objectives and designing of advertising strategy and opportunities. Measuring advertising performance. Sales promotion, planning, objectives, techniques of consumers' promotion management. Sale force trade promotions and public relations, sales promotion effect. **Product Selling:** Personal selling, types, process and models. Managing sales force, personal selling and promotion mix, preliminary considerations in planning. Framework, strategies in international marketing, major players in international markets, promoting and international strategies.

Practical:

Study the promotion skills of wholesalers and retailers. Study the promotion strategies implemented by various agri-based companies for different agricultural commodities and their products (Food grains, fruits, milk and milk products, etc.). Study the role of advertising in Agriculture sector. Visit to advertising agencies promoting agro-based product etc.

Suggested readings:

Samuel, elison. Elements of productions planning and control, navneet prakashan ltd.kalbadevi road, mumbai 400 002, by arrangement with m/s universal publishing corporation.

Kotler, phillip and gary armstrong, principles of marketing prentice –hall of india pvt. ltd, new delhi -110001. acharya,s.s and n.l agarwal. Agriculture marketing in india. Oxford and ibh publishing company pvt. Ltd.66, janpath,new delhi-110001

Divase smita. Agri-business management. Everest publishing house, everest lane,536, shaniwar peth, appa balwant chowk, pune-411030.

Burnett, john j.promotion management. virendra kumar arya for a.i.t.b.s publisher and distributor (regd.) J-5/6 krishna nagar, delhi-110051.

TAC 305 Trading of Agricultural Commodity-I 2 (1+1)

Objective: To provide exposure on the trading agri-produce in various markets and price controls.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on trading various whole and processed agri-produces.
- Gained the ability to develop economy spread sheet with producers cost, market price, marginal price, consumer's price for various crops traded in the market.
- Ability to analyze the agri-produce processing cost to pricing level.

Theory

Importance of agricultural commodities in agricultural marketing. Marketing of cereals- rice, wheat and jowar. Marketing of pulses-mung, tur, gram, urad etc. Average cost of processing wheat into wheat flour, paddy to rice, whole pulses in to split pulses, comparison of different rice milling methods. Study on price spread of important crops and producer's share in consumer's rupee. Marketing of mango, citrus and grapes. Marketing of vegetables. Improving efficiency in commodity marketing. Role of co-operative and regulated market in commodity marketing.

Practical:

Study of producer's price, marketing cost, price spread, market margin, producers share in consumer's rupee for important cereals, pulses, fruits and vegetables. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for wheat. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for jowar. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for bajra. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for cow pea. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for green gram. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for grapes. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for mango. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for banana. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for chilli. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for brinjal. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for raddish. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for bitter gourd. To estimate the producers price, marketing cost, price spread, market margin, producers share in consumer's rupee for ridge gourd.

Suggested readings:

Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India. Oxford and IBH Publishing company Pvt. Ltd., 66, Janpath, New Delhi 110001.

Mamoria, C.B. and R.L. Joshi. Principles and Practice of Marketing in India. KitabMahal, 15, Thorn hill Road, Allahbad

Objective: To impart the knowledge on the policies and strategies involved in business management.

Course outcome: Upon completion of the course students will be able to;

- Gained critical knowledge on the business policies and strategies involved in a business.
- Gained skills required for corporate and international level business.
- Ability to conduct a case studies on the business topic while developing a business.

Theory

Introduction to Business Policy: Nature, Scope, Objectives and Importance of Business Policy **Introduction to Strategic Management:** Definition, Framework, Dimensions, Levels, Tasks, Elements and Benefits of Strategic Management. **Strategic Management Process, Strategic Intent:** Vision, Mission, Business Definition, Goals & Objectives. **Environmental Analysis:** Environmental Sectors, Environmental Scanning & Appraising the Environment. **Organizational Analysis:** Dynamics of Internal Environment, Organizational Capability Factors. Techniques used for Organizational Appraisal (Enlist Only) and Value Chain Analysis. **Corporate Level Strategies – Concentration, Integration, Diversification Corporate**

Level Strategies – Internationalization, Cooperation. Corporate Level Strategies – Stability, Retrenchment & Restructuring. Strategic Analysis & Choice: Process of Strategic Choice, Strategic Analysis, Subjective Factors in Strategic Choice, Contingency Strategies & Strategic Plan. **Strategic Implementation:** Nature & Barriers of Strategic Implementation, Interrelationship of Formulation & Implementation, A Model of Strategy Implementation, Project Implementation, Procedural Implementation & Resource Allocation. Types of Organizational Structure, Stakeholders & Strategic Management, Corporate Governance and Strategic Management, Corporate Culture and Strategic Management, Corporate Politics & Power, Personal Values & Business Ethics. **Strategic Evaluation & Control:** Strategic Control, Operational Control & Techniques of Strategic Evaluation & Control

Practical:

Study on Strategic Management Process. Study on Strategic Intent. Study on Environmental Analysis. Study on Strategic Alternatives. Study on Strategy Implementation. Study on Strategy Strategic Evaluation & Control. Case Studies on above stated topics. Visit to Agro based Industry. To prepared a report on strategic Management of visited Industry.

Suggested readings:

Azhar Kazmi Strategic Management & Business Policy, Tata McGraw – Hill, Third Edition.
M. V. Kulkarni Business Policy & Strategic Management, Everest Publishing House.
Saroj Datta, Jaico Strategic Management Publishing House.
Thomas L. Wheelen & J. David Hunger Concepts in Strategic Management & Business Policy Toward Global Sustainability
R. David Strategic Management. Fred Prentice Hall International
Azhar Kazmi Business Policy & Strategic Mgt - Tata Mc Graw Hill Publi. Co. Ltd.
Beni Banerjee Strategic Management.
Jauch Lawrence R & William Business Policy & Strategic Mgt. Glueck McGraw - Hill Book Co.

PPC 305 Production Management, Planning and Control 2 (1+1)

Objective: To provide intensive knowledge on farm production activities at various level.

Course outcome: Upon completion of the course students will be able to;

- Gained complete knowledge on the planning and process steps involved in farm development.
- Gained ability to develop farm budget and resources management.
- Gained ability to show entrepreneurship skills.

Theory

Introduction, meaning and role of production management in agriculture. Elements of production, design and process planning. Effect of technological changes on the production management. Factors influencing the plant location in Agri-business activities.

Agricultural Production Planning and Control: Nature, basic functions of production planning and control, its objective, different system of manufacture production cycle, scheduling and control of production and its control procedures and devices. Total quality management, considerations, stage of quality control, standard and specifications, quality assurance and quality circles. Scheduling psychology, methodology and control techniques. Legal aspects of quality control.

Resource Planning and Budgeting: Importance and techniques, methods to study work measurement. Nature and objectives of production planning and control. Variables subject to control. Production control for contentment's, intermittent and project system. Production forecasting and production inventories. Aggregate planning, guidelines, graphic and chart planning.

Resource Management: Management of resources: Meaning, concept, source of supply of material, selection and evaluation, purchase management- Cost reduction. Store Management-location, storage methods and documentation of Government policies.

Practical:

Study of production management aspects of selected agri-business units, Visit to selected agri-business units, Discussion with entrepreneurs, Points to be considered while preparing the reports on agri-business management, Layout - example of large enterprise that consist of many small and medium plants, Scheduling a planning function and expedition control function of small firms, Preparation of memorandum, explaining merits of COS and outline how the changeover is going to take place and define the responsibility of each section in the new organization, Production planning and control: Nature, basic function of production planning and control, its objective, variants in different system of manufacture production cycle, Resource planning and budgeting – Importance and technique, work study, method of study, work measurement ,Source of supply of material – selection and evaluation, Purchase management – Cost reduction, stores management, location storage method and documentation, Institutions engaged in providing service/ facilities, Government policies, Production control for contemn's, entrepreneurs and project system, Production forecasting and production inventories' Total quality management, considerations. Stages of quality control. Quality control standards, specifications, quality assurance and quality circles.

Suggested Readings:

Samuel Elion Elements of PPC – Production & operations management

IRM 305 Inventory of Risk Management 2 (1+1)

Objective: To provide specific knowledge on monitoring and control of various types of inventory

Course outcome: Upon completion of the course students will be able to;

- Gained working knowledge on the types of inventories.
- Ability to understand the inventory and risk management in India.
- Accumulated skills to minimize the risk in various inventories.

Theory

Risk-Meaning, importance and types, minimization of risks. Introduction to Inventory – Definition, types and its need. Cycle of inventory management. Order Quantity – Economic Order Quantity (EOQ) Model. Safety stock. Pricing of raw material and valuation of stock. Monitoring and control of Inventories – ABC Analysis, Just-in-time inventory control. Criteria for judging inventory system. Inventory management in India. Storage and Warehousing. Inventory record keeping and their types.

Practical:

Estimation of Economic Order Quantity (EOQ). Estimation of cost of carrying and ordering inventories. Estimation of optimal level of safety stock. Visits to private companies for observing their working in inventory and stock management etc. Hypothetical examples on risk minimization.

Suggested readings:

Acharya, S. S. and N.L. Agrawal. Agricultural Marketing in India. Oxford and IBH Publishing Co. Ltd., 66, Janpath, New Delhi- 110 001.

Prasana Chandra. Financial Management. McGraw Hill Book, New York.

Smita Divase, Indian Agriculture and Agri. Business Management, KRISH Resource Management Network.

Pandey, Mukesh and Deepak Tiwari. Rural and Agricultural Marketing. International Book Distribution Co., New Delhi.

Samuel Elison. Elements of Productions Planning and Control, S.A. Shroff, Navneet Prakashan Ltd. Kalbadevi Road, Mumbai 400 002

APM 305 Agro-processing Management 2 (1+1)

Objective: To provide broader exposure on agri-produce and food processing industries.

Course outcome: Upon completion of the course students will be able to;

- Ability to catalogue various agri-produce processing industries and their functioning.
- Gained knowledge on establishing an agro-processing industry, budget assessment and SWOC analysis.
- Gained knowledge on policies at national and regional level relevant to food processing industries.

Theory

Role of agro-processing industries in the Indian economy. Status and potential of Indian Agro- processing industries. Food grains, commercial crops, fruits and vegetable processing, livestock processing, fishery products etc. Government policies relating to agro-processing unit. Interdependence of agro-processing industries, Problem of agro-processing units. Guideline for financing of agro-processing industries in India. SWOT Analysis, Plan and strategy to develop agro-processing industry, Government initiatives in promoting food processing industry, policy of Department of Food Processing industry, Plans of Ministry of Food Processing Industries, Legal aspects related to food processing industry, Processing zones.

Practical:

Preparation and follow-up of proposals of processing units like Oil mills, Dal Mills, Fruits and Vegetables Processing Industries, Sugar factories, Milk processing units, Wine making units etc. Exercises on economics of processing of agricultural commodities. Study of agro-processing industries of different commodities – Food grains, Fruits, Vegetables, Milk and Milk products etc.

Suggested Readings:

Srivastava, U.K. Vathsala. Agro-processing Strategy for Acceleration and Exports. Oxford University Press YMCA, Library Building, Jai Singh Road, New Delhi -110001.

Pandey, Mukesh and Deepak Tiwari. Rural and Agricultural Marketing. International Book Distribution Co. New Delhi.

Divase, Smita. Agri-Business Management. Everest Publishing House, Everest Lane, 536, Shaniwar Peth, Appa Balwant Chowk, Pune.

Rajagopal. Organizing Rural Business Policy Planning and Management. Sage Publication, New Delhi.

Official website of Ministry of Food Processing Industries, Annual Report.

Official Website of NABARD Bank, Bankable projects

FTP 502 Food Technology and Processing Management 3 (2+1)

Objective: To provide insights on food processing and technologies involved in processing management.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on the nutritional, physical and microbial quality control aspects of processed food.
- Ability to analyze the adulterants, toxicity, spoilage and health hazards detection.
- Gained knowledge on the ISO standards, laboratory analysis, certification of processed food.
- Gained knowledge on various labelling, quality control governing bodies, export/import quality control of processed food under guiding bodies.

Theory

Food quality: physical, nutritional, microbial and sensory, quality control; Hazards in supply chain, biological, chemical and physical hazards, natural contaminants, allergens, Food adulteration, toxicities due to hazards, Food infection and intoxication, risk analysis, and detection and epidemiology of food borne pathogens. ISO Food Safety Management Systems. potential risks of food borne bioterrorism, bioterrorism protection measures, Personal hygiene and sanitary food handling. Quality management and quality assurance: Total quality management, good manufacturing practices, good agricultural practices, good laboratory practices; ISO. HACCP: Principles, implementation; Plan documentation, types of records; Auditing: Surveillance, audit, mock audit, third party quality certifying audit, Certification, certification procedures, certifying bodies, accrediting bodies, international bodies.

Risk assessment and management during food preparation. Microbial standards of fresh and processed foods.

Concept of Quality management systems in India; Sampling procedures and plans; Food Safety and Standards Act, 2006, AGMARK, BIS, Global GAP, Global Food Safety Initiative; BRC, SQF, SGS, Food Codex; Export import policy, Labeling issues. export documentation; and food safety.

Practical

Estimation of CFU of water, Estimation of TDS in water. Estimation of *Listeria* and *E. Coli/Salmonella/Shigella/Staphylococcus* from food samples. Estimation of fungal toxins from food samples. Heavy metal detection (lead), Estimation of any one commonly used pesticide, HACCP for food industries by taking few models, Study of national and international microbial quality standards, visit to export oriented food processing industry,

Suggested readings:

W.C. Frazier and D.C. Westhoff Food Microbiology., 4th Ed. Tata McGraw-Hill Publishing Company Limited, New Delhi.

Ronald H. Schmidt and Gary E Food Safety Hand Book, Rodrick. 2003. John Wiley & Sons, Inc., Hoboken. New Jersey, USA.

R.E. Hester and R.M. Harrison Food Safety and Food Quality. 2001. Royal Society of Chemistry, Cambridge, UK.

GrahamGraham, H. D The Safety of Foods (Sicherheit von Lebensmitteln).

Auflage. AVI Publishing Co., Inc., Westport, Connecticut (USA)

Owin R. Fenema Food Chemistry (New Edition).

S. Deshpande Handbook of Food Toxicology., CRC Press. 2002.

SS. Roday Food Hygiene and Sanitation.,Tata McGraw-Hill Education

M.R. Adams and M.O. Moss Food Microbiology.

Inteaz Alli Food Quality Assurance: Principles and Practices. 2004. CRC Press, Boca Raton, FL, USA.

Food Plant Sanitation: Design, Maintenance, and Good Manufacturing Practices. Michael M. Cramer. 2013. CRC Press, Boca Raton, FL, USA.

Furia Regulatory status of Direct Food Additives. TE.1980. CRC Press.

Jellinek G Sensory Evaluation of Food - Theory and Practice. 1985. Ellis Horwood.

Krammer A &Twigg Quality Control in Food Industry. BA.1973. Vol. I, II. AVI Publ.

EIM 601 Export Import Management 3 (1+2)

Objective: To provide insights on the policies of relevance to export and import of agri-produce.

Course outcome: Upon completion of the course students will be able to;

- Gained critical knowledge on salient features of export and import of agri-produce.

- Gained analytical skills on trade analysis and foreign exchange methods.
- Ability to understand the mandates of agri-produce promoting agencies.
- Ability to understand the financial support by the banks and insurance policies.

Theory

Nature and scope of International Trade- Meaning and importance of International trade. Trade in domestic and International markets. Advantages and disadvantages of International trade. Salient features of International trade. Theories of International Trade- Theory of Absolute Cost Advantage, Theory of Comparative Cost Advantage and Modern theory of International Trade. Terms of trade – meaning and classifications. Free trade -Meaning, Advantages and Disadvantages. Protection - Meaning, Arguments for protection, Methods of protection: Dumping, Tariffs, Subsidies, Import quotas, cartels, Commodity Agreements. Balance of Payments- Meaning, structure and India's balance of payments position. Foreign Exchange-Foreign exchange rate, types of foreign exchange rate, mechanisms of determining foreign exchange. Instruments of international payments. Foreign Exchange Market – meaning and functions. Exchange control. Devaluation. Foreign exchange reserves. WTO-establishment and functioning. Agreement on Agriculture. Impact of AOA on agricultural trade. Export Management-Commodities exported from India. Important importing countries. Trends in exports. Types of export- Direct and indirect exports. Export Houses – their terms and conditions to facilitate export. Procedure to become an exporter. Export licensing. Steps involved in export. Agricultural export promotion agencies- APEDA, KAPPEC, MPEDA, Commodity Boards. EXIM policies. Locating the foreign importers, SPS stipulations of importing countries for agricultural products. Importance of LC, Bank guarantee & insurance.

Practical:

Study of exports of food grains, Study of exports of commercial crops, Study of exports of spices Study of exports of plantation crops, Study of exports of processed crops, Study of exports of CODEX Standards , Study of exports of procedures, Study of procedure for acquiring exporter's license Analysis of different forms and documents required in exporting a commodity, Estimation of Balance of Payments, Estimation of trend in international prices and its comparison with domestic prices, Identification of exporters and importers for various agricultural Products, Exercises on determination of foreign exchange rates, Presentation of outcomes of various rounds of WTO summits, Estimation of Terms of Trade.

Suggested readings:

Rathor B.S. and J.S.Rathor (1998). Export Marketing, Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marge, Girgaon, Mumbai – 400004.
 Dacosta G. S. and S. B. Gaddamwar (First Ed. 1998) Exports of Agricultural Commodities from India. Himalya Publishing House. "Ramdoot". Dr. Bhalerao Marge, Girgaon, Mumbai-400004.
 Singh R. P. implication of GATT/WTO on Agriculture and Rural Development (Proceedings of the Seminar, March 14-16, 1996.) NIRD, Rajendranagar, Hyderabad – 30
 Balagopal T.A.S.). Export Management. Ramdoot (13th ed. 1998)Dr. Bhalerao Marge Girgaon, Mumbai – 400004.
 Puri V.K. (1997-2002), How to export, Neha Publication, New Delhi – 110001.
 Varma M.M. and R. K. Agarwal. (1998). Foreign Trade Management. Nai sarak King Books, Educational Publishers, 1684, Delhi – 110006.
 Mamoria C. B. and R.L. Joshi, (1971) Principles and Practice of Marketing in India, Kitab Mahal, 15, Thorn hill Road, Allahabad.
 Acharya S. S. and N. L. Agarwal, Agricultural Marketing in India. Oxford and IBH Publishing Company. Pvt. Ltd. 66, Janpath. New Delhi – 110001.

RMT 602 Retail Management 3 (1+2)

Objective: To provide insights on retail chain operation, merchandizing and organizational set up involved in retailing of agri-produce.

Course outcome: Upon completion of the course students will be able to;

- Ability to analyze the retailing sector agri-produce.
- Gained skills to understand the merchandizing, price control, branding and advertising to promote product sales.

- Gained knowledge on the franchising and retail store management.

Theory

Introduction to Retail Management Evolution of retailing, meaning, retailing and retail management, Retailing in India. Types of retailers- stores formats by location, store formats by ownership, store formats by merchandise categories, store formats by size, store formats by price, store formats and non-store formats. Organized retailing and unorganized retailing, trends in retailing – special- convenience, growing diversity of retailing formats, e-commerce, franchise, mail order catalog, etc. Retail location and retail layout - importance of location decision, selection of city/area, selection of a specific site. Types of location – free standing location, neighborhood services, highway stores, business associated location, cost factor in location decision. Types of consumer goods - consumer goods, shopping goods, specialty goods, FMCGS – Fast Moving Consumer Goods. Retail layout patterns – layout guidelines, external factors and internal factors, building interiors. Retail market, segmentation – market and market segmentation, market approaches, benefits of market segmentation – marketing mix, merchandising decision, promotion campaign. Criteria for market segmentations dimension of segmentation, demographic segmentation, psychographic segmentation. Retail strategies – develop vision and mission statements, operational excellence, produce differentiation, customer intimacy, growth strategy, market expansion strategy, market penetration, market development, product range development, diversification. Retail merchandising – merchandising planning, merchandising hierarchy, SKU, range planning, planogram, buying function – advantages of an open to buy plan. Category management – category vision, definition, category role, assessment strategies, balanced score card, tactics, category implementation, markups and markdowns in merchandise management, shrinkage in retail merchandise management, gross margin return on inventory (GMROI) Supply chain management in retailing definition, ISC, vender management, EDI, warehouse management. Retail marketing and advertising – retail marketing strategies, retail marketing mix, customer relationship management (CRM). Direct marketing – direct mail, catalogues and mail order, telemarketing, electronic retailing, micro-marketing advertising in retailing – advantages, types of advertising, advertising campaign. Brand management – branding, brand management of retail outlets. Merchandise management – target market and competition, analysis, planning, merchandise budget plan, inventory plan, and criteria for selection of suppliers. Pricing and Communication – Introduction, Concept of Retail Price, Retailing Pricing Strategies – Demand Oriented Pricing, Market Skimming, Penetration Pricing, Price Bundling, Leader Pricing, Multi Unit Pricing, Every Day Low Pricing and its benefits, Odd Pricing, Single Pricing, Multiple Pricing, Prestige Pricing. Methods for setting Retail Prices– Cost based method, Competition based method, Demand oriented pricing method. Pricing Adjustments, Retail Promotion Strategy – Introduction, Selection of Promotion Mix-Control, Flexibility, Credibility, Cost. The Retail Marketing Mix- Product, Price, Place, Promotion, Presentation, Customer Service, People. Advertising-objectives, Significance, Benefits. Types of Advertising- Persuasive Advertising, Informative Advertising, Corporate Advertising, Financial Advertising, Classified Advertising. Steps involved in Retail Advertising Campaigns – Selecting Advertisement objectives, Retail operations – Areas of retail operations, Stores operating parameters, Customer conversion ratio, Returns of net sales, Transaction per hour, Sales per transaction, Hourly customer traffic. Stocks – Average selling price, average stock price, Stock turnover/inventory turnover, franchising in retailing – franchising, types of franchise agreement. Retail Information System and Advantages of retail data base of RIS.

Practical:

Exercise on Booming Retailing in India, Exercise on Functions Perform by Retailer and Wholesaler, Exercise on Retail Formats found in India, Survey of Public Retail store, Survey of Private Retail Format, Survey of Co-operative Retail Store, Survey of Traditional Retail Formats, Exercise on Non-store Retail Formats, Exercise on Franchisee concept ,Exercise on any Hypermarket, Exercise on process of Retail Location ,Exercise on Store Design, Exercise on Store Administration, Exercise on Consumer Goods, Exercise on Retail Consumer Behaviour, Exercise on Market Segmentation of consumers ,Exercise on Retail Consumer Behaviour, Exercise on Retail Marketing Strategy, Estimation of Retail Pricing, Exercise on Promotional Pricing Strategy, Exercise on Factors Influencing Indian Retail Industry, Exercise on Merchandising Procurement Process ,Exercise on Retail Advertising, Exercise on Brand image, Exercise on Labeling, Exercise on Packaging, Exercise on Product Promotional Tools, Exercise on New Emerging Trends in Retailing ,Exercise on Supply Chain Management in Retailing, Exercise on Sales Promotion used in retailing, Exercise on Technology Distribution in Retailing, Case Study of any Retail Formats study Operation Management.

Suggested readings:

Kotler, Phillip and Gary Armstrong. Principles of Marketing. Prentice- Hall of India Pvt. Ltd, New Delhi – 110 001.

Prasana Chandra. Financial Management. McGraw Hill Book, New York.
Retailing Management Swapna Pradhan, McGraw Hill

Burnett, John J. Promotion Management. Virender Kumar Arya for A.I.T.B.S Publisher and Distributor (Regd.) J-5/6
Krishan Nagar, Delhi – 110 051.
A.V. Kulkarni Distribution and Retail Management., Nirali Prakashan.
M.V. Kulkarni Retail Marketing Management., Everest Publication House.

ENS 306 Environmental Studies and Disaster Management 3 (2+1)

Objective: To get an insight into various environmental components including ecosystem, ecological succession and disaster management.

Course outcome: Upon completion of the course students will be able to;

- Knowledge about various types of energy sources (renewable and non-renewable).
- Know various components of an ecosystem.
- Know various types of pollution sources and their management.
- Acquired knowledge on various kinds of disasters and their management.

Theory

Unit 1: Multidisciplinary nature of environmental studies Definition, scope and importance

Unit 2: Natural Resources: Renewable and non-renewable resources Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles. **Unit 3:** Ecosystems • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem. • Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem- a. Forest ecosystem, b. Grassland ecosystem, c. Desert ecosystem, d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) **Unit 4:** Biodiversity and its conservation- Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss,

poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. **Unit 5:** Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution, b. Water pollution, c. Soil pollution, d. Marine pollution, e. Noise pollution, f. Thermal pollution, g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. **Unit 6:** Social Issues and the Environment: From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dyes. Wasteland reclamation. Consumerism and waste products. Environment Protection Act- Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation. Public awareness. **Unit 7:** Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Program. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies. **Unit 8:** Field work Visit to a local area to document environmental assets river/forest/grassland/hill/mountain, visit to a local polluted Site-Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

Disaster Management

Unit-1: Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. **Unit-2:** Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. **Unit-3:-**Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community – based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Suggested readings:

Erach Bharucha Text book of Environmental Studies for undergraduate courses University Grants Commission, New Delhi.
P.D. Sharma Ecology and Environment, Rastogi Publication. Meerut.
S.S. Purohit, Q.J. Shammi and A.K. Agrawal Environmental Sciences, Student Edition, Jodhpur.
M. Prasanthrajan and P.P. Mahendran., A text book on Ecology and Environmental Science Agrotch Publishing Academy, Udaipur-313002.
The biodiversity of India, Maplin Publishing Pvt. Ltd., Ahmadabad.
Sarthak Singh Disaster Management. Oxford Book Company.
Dr. B.K. Khanna and Nina Khanna Disaster - Strengthening Community Mitigation and Preparedness. New India Publication Agency.
Amrit Kaur Laboratory Manual of Ecology and Environmental Studies, Paragon International Publisher, New Delhi.

IDM 306 Integrated Disease Management 2 (1+1)

Objective: Provide insights on basic principles and procedure of integrated disease management.

Course outcome: Upon completion of the course students will be able to;

- Explain the various concepts, principles and tools of IPM.
- Explain the methods for detection and diagnosis of diseases and to calculate the dynamics of economic injury level.
- Ability to perform survey and forecast diseases outbreak.
- Ability to develop and validate different modules of IPM.

Theory

Introduction, History of Plant Pathology: History and development of Plant Pathology in different eras, contribution made by different scientists in IDM & significant plant diseases. Definitions and objectives of Plant Pathology: Concepts of disease, Important plant pathogenic organisms: Different groups like fungi, bacteria, fastidious bacteria, viruses and phytoplasma with examples of diseases caused by them, Disease: economic importance and losses caused by plant diseases, Basic procedures in the diagnosis of plant diseases. Definition of IDM, concept, advantage and importance. Principle approaches to IDM: Direct action against the pathogen, genetic modification of the host to resist disease and modification of the environment. Exclusion: Legislation (Quarantines, Regulation measures), eradication, protection. Epiphytotic diseases, epidemic and diseases forecasting in IDM. Present status of fungicides / bio-agents in India, their use and restriction in plant disease control. Integrated control in a perennial crop, and annual crops. Development of IDM strategy for important crops, Cash crops- Sugarcane, cotton, Cereals- Paddy, sorghum, wheat, Pulses- Pigeon pea, Oilseed crops- Ground nut, Fruits- Mango, Grapes, Pomegranate, Banana, General IDM strategies for Vegetable crops

Practical:

Acquaintance to Plant Pathology laboratory and equipment, Preparation of culture media for fungi and bacteria, Isolation techniques, Demonstration of Koch's postulates, Collection, preparation of mounts, and diagnosis of disease samples and their preservation. Isolation of pathogens from the collected samples and their identification. IDM components and implementation of IDM strategies. Phytosanitary measures and certification. Impact of IDM implication. Fungicides: fungicide formulations, commonly available fungicides in market Method of their application

of fungicides. Bio-agents: Different bioagents, their methods of application and diseases controlled. Visits to field / orchard, visit to bio agent mass multiplication laboratory.

Suggested readings:

R.S.Singh Introduction of Principles of Plant Pathology, Oxford and IBH Publ. Co., New Delhi (1996)
V.N.Pathak Essentials of Plant Pathology, Prakash Publ., Jaipur (1972)
G.N.Agrios Plant Pathology 4th edition Academic. Press, New York (1997)
M.N.Kamat Introductory Plant Pathology by, Prakash Publ, Jaipur (1967)
R.S.Singh Plant Diseases
H.C.Dube Introductory Plant Pathology
Dube, H.C. Pathology.
Singh, R. S. Introduction to principles of plant pathology. Oxford and IBH Pub. Co., New Delhi.
Pathak, V. N. Essentials of plant pathology. Prakash Pub., Jaipur
Agrios, G. N. Plant pathology. 5th edition, Published by a division of Reed Elsevier India Pvt., Ltd., New Delhi (2005)
Kamat, M. N. Introductory Plant Pathology. Prakash Pub, Jaipur
Singh, R. S. Plant diseases
Alexopoulos, Mims and Blackwel. Introductory Mycology Introductory Plant.

EDB 306 Entrepreneurship Development and Business Management 2 (1+1)

Objective: To provide critical knowledge on the entrepreneurial skills involved in business management.

Course outcome: Upon completion of the course students will be able to;

- Ability to understand the characteristics of the entrepreneurship.
- Gained knowledge on leadership qualities and traits.
- Gained insights on development of entrepreneurial project and planning.
- Gained skills to develop start-up with innovative strategies.

Theory:

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and program and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/Agri enterprises, Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.

Practical:

Assessing entrepreneurial traits, problem solving skills, managerial skills, financial skill, HRM skill, Business analytical skill and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs, case study on ED, **Ideation and Start-up initiatives, planning and strategic implementation process.**

Suggested readings:

V. Gangadhar *et al.* Entrepreneurship Development. Kalyani Publishers, Ludhiana.
J.M. talathi *et al.* Introduction to Agricultural Economics & Agribusiness Management. Ane Books Pvt. Ltd. New Delhi
Ellis, R.S., Educational Psychology. D.N. Van No Strand Co. Inc. New York.
Entrepreneurship Development Institute of India (1987), Developing New Entrepreneurs, EDIT, Ahmedabad, NISIET. Library: 338-93/EDI/87/25104.
Khanka S.S. (2001), Entrepreneurial Development chand and company Ltd, 7361, Ramnagar, New Delhi – 110055.
Vasant Desai (2004), Dynamics of Entrepreneurial Development and Management.
Agarwal R.C. Fundamentals of Entrepreneurship.

Akhouri, M.M., P. Mishra S.P. and Sengupta, Ritha (1989). Trainers manual on developing entrepreneurial motivation, NIESBUD, NEW Delhi.

Entrepreneurship Development Institute of India (1987), Developing New Entrepreneurs, EDIT, Ahmedabad, NISIET. Library: 338-93/EDI/87/25104.

Betty Gordan B (1979). Entrepreneurship, playing to win. Taraporewala, Bombay.

Mancuso Joseph (1974). The entrepreneur's handbook (1st and 2nd). Artech House, INC, USA

Singh A.K., Lakhan Singh, R. Roy Burman (2006). Dimensions of Agricultural Extension. Aman publishing House, Meerut.

Khanka S.S. (2001), Entrepreneurial Development chand and company Ltd, 7361, Ramnagar, New Delhi – 110055.

Vasant Desai (2004), Dynamics of Entrepreneurial Development and Management.

Morgan, C.T. Klng, R.A. Robinson, N.M. (1979). Introduction to Psychology-Tata M. Graw Hill Publishing Co., New Delhi.

Agarwal R.C. Fundamentals of Entrepreneurship

Hans Raj Bhatia 2003. A textbook of Educational Psychology, New Delhi

FMA 306 Financial Management in Agri-Business 3 (2+1)

Objective: To introduce to agricultural financing, source capital, credits agri-business portfolio management.

Course outcome: Upon completion of the course students will be able to;

- Gained insights on financial capital management in agri-business.
- Gained analytical knowledge on operations and legal aspects of credits.
- Acquired the information on national crop insurance schemes.

Theory

Agriculture Finance: Nature and scope, importance of agriculture finance. Agricultural finance as a part of public finance. Source of capitals: Meaning and concept of agriculture credit, classification and forms of credit. Credit as a tool of economic development. Cost of credit, interest rates of credit, 3 R's, 5 C's and 5 P's of credit. Credit creation and credit control. Credit rationing and planning. Legal aspects of credit, supervised credit. credit demand and supply, credit institution, credit policy and needed changes. Preparation of Performa of income statement, Performa of balance sheet and cash budget. Portfolio management, financial ratio analysis, Break-even analysis Investment analysis. Capital market. Operations analysis.

Crop insurance schemes, risk management tools, index based insurance and benefits, consumer protection, methodologies to apply for insurance, farmer training plan, calculation of crop asset values and insurance liability. National Agricultural Insurance scheme (NAIS), Pilot Modified National Agricultural Insurance Scheme (MNAZIS), Pilot Weather Based Crop Insurance Scheme (WBCIS), Pilot Coconut Palm Insurance Scheme (CPIS)

Practical:

3 R's, 5 C's and 5 P's of Agriculture credit. Financial ratio analysis: Liquidity ratio, Leverage ratios, Turnover analysis, Profitability ratios, Valuation ratios with their example, Comparative analysis. Application of financial statement analysis, Break-even analysis, Investment analysis.

Suggested readings:

Patnkar, S.V. Financial Management. Everest Publishing House Everest, Pashuram Apartment, 12, Sankalp Society, Paud Phata Road, Opp. Jog Hospital, Pune- 411 038.

Jain, S.C. Management in Agriculture Finance. Vora and Company. Publishers Pvt. Ltd., 3 Round Building, Kalbadevi, Mumbai – 400 002.

Prasana Chandra. Financial Management. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

Kahlon, A. S. and Karam Singh. Managing Agricultural Finance - Theory and Practice. Allied Publisher Pvt. Lt., 165, J. N. Heredia Marg, Ballard Estate, Mumbai – 400 038.

Patnkar, S.V. Financial Management. Everest Publishing House Everest, Pashuram Apartment, 12, Sankalp Society, Paud Phata Road, Opp. Jog Hospital, Pune- 411 038.

Jain, S.C. Management in Agriculture Finance. Vora and Company. Publishers Pvt. Ltd., 3 Round Building, Kalbadevi, Mumbai – 400 002.

Prasana Chandra. Financial Management. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

Kahlon, A. A. and Karam Singh. Managing Agricultural Finance - Theory and Practice. Allied Publisher Pvt. Marg, Ballard Estate, Mumbai Lt., 165, J. N. Heredia

TAC 306 Trading of Agricultural Commodity-II 2 (1+1)

Objective: To provide exposure on the trading of agri-produce in various markets and price controls.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on trading various commercial crops.
- Gained the ability to develop economy spread sheet with producers cost, market price, marginal price, consumer's price for various crops traded in the market.
- Ability to analyze the export and inputs potentials of inputs and agri-produce.

Theory

Marketing of commercial crops with special reference to all marketing functions and price analysis. Commercial commodities - cotton, sugarcane, onion, grapes, banana, citrus, mango, cut flowers –roses, gerbera, gladiolus, etc. vegetables – cauliflower, cabbage, tomato, potato, onion, ladies finger, brinjal. Existing levels of processing and future potential. Export and export potential of agricultural inputs and outputs, import and export of agricultural produces

Practical

Practical exercises on performance of various marketing functions of selected commercial fruit and vegetable crops. The estimation of marketing cost, market margins and producer's share in these commodities. Visits to various commodity markets, processing units and their detail studies.

Suggested readings:

Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India Oxford and IBH Publishing Co. Ltd., 66, Janpath, New Delhi. 110 001.

Mamoria, C.B. and R.L. Joshi. Principles and Practices of Marketing in India. Kitab Mahal, 15, Thorn Hill Road, Allahabad.

Panvar, J.S. Beyond Consumer Marketing. Response Books Sage Publications, New Delhi.
From Internet Domestic Market Research.

CMM 306 Commodity Market 2 (1+1)

Objective: To provide theoretical knowledge on the concepts involved in commodity marketing process.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on hedging and trading risks.
- Gained information on the commodity exchange and role of commodity markets.
- Acquainted with the global commodity markets vis-à-vis Indian commodity market.

Theory

Hedging and Future Trading Risk - Meaning and importance, Types of risk, Minimization of risk. **Speculation**- Meaning, economic Benefits, **Hedging**- Meaning, Benefits of hedging, Difference between hedging and future trading, **Future trading** -Meaning, commodities for future trading, service rendered by forward market, Danger of forward market, Forward Market commission, Progress in India. **Introduction to Commodities Market**- Emergence of Commodity Market, Dynamics of global Commodity Markets, Indian commodity markets – Current status and future prospects. **Strengthening Commodity Markets in India**- Role of Government, Role of Commodity Exchanges, Other Institutions, Training and development of Dealers, Role of Information in Commodity Markets

Practical: Case studies on various commodities in commodity market.

Suggested readings:

Purcell wd. 1991. Agriculture futures & options: principles & strategies. Macmillan publications
Chatnani Commodity markets – operations, instruments & applications, Indian commodity derivatives by Indian institute of banking & finance, Macmillan
John wiley & sons Kaufman pj.1986. The concise handbook of future markets.
Wasendorf rr&mccafferty 1993. All about commodities from the inside out. Mcgraw – hill
Micha, Commodity options: trading and hedging volatility in the world's most lucrative market, carley garner & paul britain, pearson agriculture commodity markets: a guide to future trading
Usda and FAO published guides for farmers.
Purcell WD. 1991. Agriculture Futures & Options: Principles & strategies. Macmillan Publications
Chatnani Commodity Markets – Operations, Instruments & Applications, TMGH, Macmillan Indian Commodity Derivatives by Indian Institute of Banking & Finance

MAC 306 Managerial Accounting 2 (1+1)

Objective: To provide logical and practical exposure to accounts book keeping of a business.

Course outcome: Upon completion of the course students will be able to;

- Gained the working knowledge on book keeping, creation of balance sheet, accounting and auditing.
- Acquired ability and skills to independently manage accounting of business.

Theory

Managerial Accounting: Book-Keeping-Meaning, Definition, Classification of Accounts & Rules, Journalizing the Transactions, Ledger Accounts, Trial Balance **Cash Book:** Two Column Cash Book, Three Column Cash Book, Petty Cash Book **Final Accounts of Sole Trader:** Trading Account, Profit & Loss Account and Balance-Sheet **Farm Accounting:** Introduction, Objectives of Farm Accounting, Features of Farm Accounting, Form of Crop Account, Form of Live-Stock Account

Basics of Costing & Auditing Costing: Origin of Costing, Meaning & Definition, Objectives, Advantages & Limitations of Costing, Difference between Financial Accounting & Cost Accounting **Auditing:** Meaning & Definition, Nature, Objectives, Advantages of Auditing

Elements of Cost: Material, Labour and Other Expenses, Classification of Costs, Cost Unit, Cost Centre

Practical

1. **Journal** - Preparation of Journal Entries
2. **Ledger** – Preparation of Ledger Accounts
3. **Trial Balance** - Preparation of Trial Balance
4. **Cash Book** – Two Column Cash Book
5. **Cash Book** – Three Column Cash Book
6. **Cash Book** – Petty Column Cash Book
7. **Final Accounts of Sole Trader** – Preparation of Trading Account
8. **Final Accounts of Sole Trader** – Preparation of Profit & Loss Account
9. **Final Accounts of Sole Trader** – Preparation of Balance-Sheet

10. **Cost Sheet** – Preparation of Cost Sheet

11. **Farm Accounting** - Preparation of Crop, Live-stock and Dairy Account

Suggested Readings:

M. G. Patkar Book Keeping & Accountancy; Phadke Prakashan, Kolhapur.

S. Subba Reddy, P. Raghu Ram, T. V. Neelakanta Sastry & I. Agricultural Economics, Bhavani Devi, Oxford & IBH Publishing Company Pvt. Ltd, New Delhi.

S. M. Inamdar Cost & Management Accounting, , Everest Publishing House, Pune

S. S. Johl & T. R. Kapur Fundamental of Farm Business Management, , Kalyani Publishers New Delhi.

J. P. Bhosale Corporate Accounting: Chaitanya Prakashan, Nashik.

J. P. Bhosale Cost & Works Accounting, Chaitanya Prakashan, Nashik.

J. P. Bhosale, Auditing: Atharva Prakashan, Pune.

R.L.Gupta & M. Radhaswamy Advanced Accountancy: By (Sultan Chand & Sons, New Delhi).

MSP 306 Market Survey and Price Analysis 2 (0+2)

Objective: To provide practical knowledge on the development of questionnaires, collection of data, analytical abilities and interpretation of the data.

Course outcome: Upon completion of the course students will be able to;

- Ability to design questionnaire for market survey and data collection.
- Gained skills to interpret the data and writing a report.
- Gained skills to conduct the market research for price analysis of agri-produce and trend analysis.

Practical

Marketing research processes. Sources of Data. Conducting Interviews for market survey. Constructing Schedule/Questionnaire. Mechanics of Analysis and Interpretation of Data. Diagrammatic Representation of Research Results. Writing a Report on Market Survey **Market information system and marketing research**. List of agencies and publications for market information. Appendices used for Market Information Importance of Prices in Agriculture Trends and fluctuation of prices in agriculture. Price Policy in India. Price determination in Agricultural Product. Different Prices in Agriculture. Procedure for determining MSP. Trends in MSP over decade. Input factor prices in Agriculture. Study of Arrivals and Prices of Major farm products. Trends in Production

Suggested readings:

Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India. Oxford and IBH Publishing Company Pvt. Ltd. 66, Janpath, New Delhi – 110 001.

Ramaswamy, V. S. and S. Namakumari. Marketing Management, Planning, Implementation and Control. MacMillan Co. 866, Third Avenue, New York – 10022.

C.R. Kothari & Gaurav Garg Research Methodology Methods & Techniques.

Dr. Ravindranath V.Badi, Narayana V.Badi Rural Marketing C.B. Mamoriya & R. K. Suri Marketing Management Subba Reddy, P. Raghuram Agriculture Economics Indian Journal of Agricultural Economics Indian Journal of Agricultural Economics and Statistics (Hind Publication) Agriculture Economics and research review New Delhi Ministry of agriculture, Government of India, APMC, Marketing board.

Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India. Oxford and IBH Publishing Company Pvt. Ltd. 66, Janpath, New Delhi – 110 001.

Ramaswamy, V. S. and S. Namakumari. Marketing Management, Planning, Implementation and Control. MacMillan Co. 866, Third Avenue, New York – 10022.

Objective: To provide insights on the retail supply chain systems of agri-produce and its characteristics.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on various components of the supply chain.
- Ability to identify the limitations at various levels of supply chain and retailing of agri-produce.
- Gained analytical ability to develop insurance and ware housing.

Theory

Overview of Supply Chain Management: Nature and Concept, Value Chain, Functions and contributions Framework for supply chain solution, Supply chain relationships, Cold Chain Management. **Overview of Logistics:** Nature and concept, Logistical mission and strategic issues, Logistical competitive advantage, Strategic logistics planning process, Components of logistics management, Functions of logistics management, Integrated logistics system. **Demand Forecasting-** Nature and components, Impact of forecasts on logistics and supply chain management, Effective forecasting process, Forecasting techniques, Selecting the appropriate forecasting technique, Operating principles of demand forecasting. **Inventory-** Concept and types, Functions of inventory in logistics and supply chain management, the role of cycle inventory in a supply chain, Economies of scale to exploit fixed costs, quantity discounts, the role of safety inventory in a supply chain, Determining appropriate level of safety inventory, Impact of supply uncertainty on safety inventory, Elements of inventory costs, J-I-T system. **Marketing Logistics System-** Concept of marketing logistics system, Planning physical distribution. **Purchasing and Sourcing Management-** Nature, scope and importance, Purchasing process trends for improved productivity, Contemporary sourcing and supplier management. **Transportation and Insurance in Supply Chain-** The role of transportation in supply chain, Modes of transportation and their performance characteristics – Road transport and rail transport, Transport insurance. **Warehousing and Material Handling System-** Need and role of warehousing, Warehousing functions, Types of warehouses, Warehouse layout and design, Warehouse management system. **Coordination in a Supply Chain-** Lack of supply chain coordination and Bullwhip effect, the effect of lack of coordination on performance, Obstacles to coordination in a supply chain, Managerial levers to achieve coordination, Building strategic partnership and trust within a supply chain. **Information Technology for Supply Chain Management-** IT applications in SCM, Advanced planning and scheduling (APS), Data warehouse, Data mining, Warehouse and data warehouse aspects, warehousing decisions, Use of data mining tools in SCM, Role of knowledge worker in SCM.

Practical:

Visit to cold different cold storages and prepare the technical report. Visit to logistics depot related to agriculture and allied products. To study different commodity exchanges to find out demand forecasting. To study different logistics and supply chain units for the purpose of studying inventory management system. To verify JIT system in that unit. Study of various purchasing and sourcing processes. To study the different transport and insurance. To study the warehouse layout and design. To study different types of software's in SCM.

Suggested readings:

R. Balakrishnan Supply Chain Management for Indian Agriculture Logistics and Supply Chain Integration – Ian Sadler – Sage – 2007

Managing Customer and Supplier Relationships – APICS module 3

Philip B Sachary Managing and Global Supply Chain –, Larsen - Viva Books – 2000

Joel D. Wisner, G.K. Leong, Keah Principles of Supply Chain Management – A Balanced Approach — Choon Tan – Cengage Learning – 2008

K. Shridhara Bhat Supply Chain management– Himalaya Publishing – 2010

Sunil Sharma Supply Chain Management — Oxford University Press – 2010

Ian Sadler Logistics and Supply Chain Integration– Sage – 2007.

Objective: To provide insights on value addition and quality control of agri-produce.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on the steps involved in value addition process.
- Analytical abilities to organize the logistics required for the processing to value addition followed by subsequent quality control, branding and packaging.
- Ability to analyze the needs for the transportation and storage facilities to maintain the quality of the value added agri-produce.

Theory

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. Storage-Meaning and functions. Different storage structures. Storage methods for food grains, oilseeds, commercial and horticultural crops. Economics of storage.

Transportation- Meaning and functions. Modes of transport, transportation of food grains, oilseeds, commercial and horticultural crops. Economics of transportation. Packaging- Meaning and functions. Materials used for packaging of food grains, oilseeds, commercial and horticultural crops. Economics of packaging. Special requisites for marketing of livestock and its Products-Processing, Storage, Transportation and Packaging. Economics of marketing of livestock and its products. Special requisites for marketing of fish- Processing, Storage, Transportation and Packaging. Economics of marketing of fish. Special requisites for marketing of cocoons-Processing, Storage, Transportation and Packaging. Economics of marketing of cocoons.

Practical:

Economics of value addition at different stages for different products, visits to processing units, logistics, godowns, ware houses, etc.

Suggested readings:

S.S. Acharya, N.L. Agrawal Agricultural marketing in India.

H. Evan Drummond, John. W. Goodwin Agricultural economics II nd edition,

S.C. Gaur and D. Singh. A Handbook of Agri-business,

Mukesh Pandey, Dipali Tiwari Rural and agricultural marketing, Opportunities challenges and business strategy,

Neelam Khetarpaul, Darshan Punia Food packaging,

RAB 402 Recent Advances in Banking 3 (2+1)

Objective: To provide process and policies involved in evolution of the banking systems.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on banking systems, types of banks and national policy control of banks.
- Gained ability to understand the types of credits, interest calculation, funding for agri-based industries.
- Gained knowledge on RBI, NABARD and schemes available to farmers through banking systems.

Theory

Definition of Banking, meaning, Evolution of Banking Institutions, History of banking system in India, list of public and private sector banks in India, Indian Banks operation abroad, functions of a bank, difference between organized and unorganized banking sector.

Central banking- Functions of a Central bank, Monopoly of Note Issue, Monetary policy, Qualitative instruments of monetary policy and recent trends in Central banking. Reserve Bank of India- Genesis, Nature and functions of RBI, Role of RBI, Departments of RBI, difference between central bank and other banks.

Commercial banks- functions of commercial banks and the services rendered by them, General structure and methods of commercial banking, Mechanism of Credit Creation, The Clearing House System, Systems of Banking-Group v/s Chain banking, Unit v/s Branch banking, Mixed v/s Investment banking, Universal banking, Merchant banking, Virtual banking, Green banking.

Cooperative bank- Structure of Cooperative banking sector, Urban Cooperative banks, Rural Cooperatives banks, Banker and Customer, Relationship between Banker and Customer- General Features of the Relationship

National Bank for Agriculture and Rural Development (NABARD)- Functions, resources of NABARD, Kissan Credit Card Scheme, Role of NABARD in rural credit.

Precautions to be taken while opening a bank account, Different types of accounts- Hindu Undivided Family, Married Women, Pardanashin Lady, Illiterate Person, Blind Person, Insolvent Person, Insane Person, Intoxicated, Executors and Administrators, Liquidators, Trust, Societies and Clubs, Minors, Agents, Joint Accounts, Partnership Firms, Joint Stock Companies.

Cheques-Requisites of a cheques, dating of cheques, crossing of cheques, Endorsements, Marking of cheques, Holder and Holder in Due Course, Liability of the drawer for dishonor of cheques.

Promissory notes- definition, kinds and legal decisions. Customers pass Book-Entries in the pass book, effect of errors favorable to the banker and those favorable to the customers, closing an account. Customer service in banks- customer service guidelines, banking ombudsman scheme, customer service nomination facility and improvement of customer services. KYC norms and Anti-money laundering- policy on Know Your Customer (KYC) standards/Anti-money Laundering(AML) measures.

Payment and settlement system- New Age Clearing- Payment and settlement systems in Banks, Electronic fund transfer (EFT), Electronic Clearing Service (ECS), MICR clearing, Core banking solution (CBS), National gateways- Real time gross settlement, RTGS operations, International gateways- Society for Worldwide Interbank Financial Telecommunications (SWIFT).

Changing profile of Indian banking- from Security orientation to purpose orientation, the challenges ahead.

Technology in banks-Technology, E- banking, Internet banking, Tele banking, M banking, Risks associated with internet banking. Banking products- Introduction, Deposit products, Remittance products, IT products and loan products.

Bank marketing- Introduction, Bank- A marketing organization, Marketing the banking products in India, Characteristics of Bank Marketing, Impact of Economic Reforms and the IT revolution, Emerging issues in Indian Banking. Banking sector- Corporate banking, Retail banking, International banking, Rural banking, Regional Rural Banks.

Foreign exchange-Meaning and Significance, Rate of Exchange, Exchange Controls- aims of exchange control, devaluation of rupee, Methods of Exchange Controls- intervention and restrictions.

Loans and advances- Principles of Bank Lending, Methods of Granting Advances, Secured Advances. Priority sector lending- Background, Small scale industries-RBI guidelines, Sub targets for all scheduled commercial banks. Non-Performing Assets-Definition, Impact of NPAS, consequence of NPAS, identification of NPAS. Latest in banking- Autonomy package for banks, Tax matters, 12 hour banking, Dematerialization, Mutual fund, Insurance business by Banks

Practical:

Practical exposure visit to commercial bank, lead bank and visits to different cooperative banks like PACS, DCC Banks. Solving problems related to banking sector.

1. Study of Banking sector- Corporate banking, Retail banking, International banking, Rural banking, Regional Rural Banks.

2. Study of Different types of accounts- Hindu Undivided Family, Married Women, Pardanashin Lady, Illiterate Person, Blind Person, Insolvent Person, Insane Person,

Intoxicated, Executors and Administrators, Liquidators, Trust, Societies and Clubs, Minors, Agents, Joint Accounts, Partnership Firms, Joint Stock Companies.

3. Study of Requisites of a cheques, dating of cheques, crossing of cheques, Endorsements, Marking of cheques, Holder and Holder in Due Course, Liability of the drawer for dishonor of cheques.

4. Study of Customers pass book-entries in the pass book, effect of errors favorable to the banker and those favorable to the customers, closing an account.

5. Study of Customer service in banks- customer service guidelines, banking ombudsman scheme, customer service nomination facility and improvement of customer services.

6. Study of KYC document for opening accounts & loan purpose.

7. Study of changing profile of Indian banking- from Security orientation to purpose orientation, the challenges ahead.

8. Study of Technology in Banks-Technology, E- banking, Internet banking, Tele banking, M banking, Risks associated with internet banking.

9. Study of Banking products- Introduction, Agricultural products, Deposit products, Remittance products, IT products and loan products.

10. Study of Various Agricultural loan proposal in Indian Banking sector.

11. Study of Loans and advances- Principles of Bank Lending, Methods of Granting Advances, and Secured Advances.

12. Study of Priority sector lending- Background, Small scale industries-RBI guidelines, Sub-targets for all scheduled commercial banks.

13. Study of Nonperforming Assets-Definition, Impact of NPAS, consequence of NPAS, identification of NPAS.

14. Practical exposure visit to commercial bank, lead bank and visits to different cooperative banks like PACS, DCC Banks. Solving problems related to banking sector.

BBP 403 Planning, Formulation and Evaluation of Business Projects 3 (1+2)

Objective: To provide analytical and planning training to develop a viable agricultural business plan.

Course outcome: Upon completion of the course students will be able to;

- Ability to develop an agriculture business project identifying the gaps to build a business models.
- Gained the analytical abilities to build financial budget break-up plan.
- Ability to develop a complete step-wise plan on a viable business project in agri-business.

Theory

Agriculture Project: Meaning, types and their importance in development. Economic and financial analysis of agricultural projects. Cost-benefit estimates of different types of projects, Cash-flow, Shadow price, calculation of economic prices, comparing costs and benefits such as the Net Present Worth (NPW or NPV), the Benefit Cost Ratio (BCR), Internal Rate of Returns (IRR), Cash flow, Pay Back Period (PBP). Guidelines for building up cost and return analysis, project area, characterization and components, financial and economic analysis. Project approach to agricultural leading enterprises practical steps in project formulation. Financial appraisal of a project. Application of Program Evaluation and Review Technique (PERT, CPM), Sensitivity analysis, Social Cost Benefit Analysis (SCBA).

Practical:

Practical exercises on project preparation for securing loan. Estimation of measures of economic evaluation such as NPV, BC ratio, Internal Rate of Returns (IRR), Pay Back Period (PBP). Sensitivity analysis to judge the economic viability of a project. Complete project proposal. Exercises on CPM and PERT techniques.

Suggested readings:

Prasana Chandra: Project Planning Analysis, selection, Analysis, Implementation and Review
Barde, S. D. and K. G. Karamkar: Agricultural Project Management for Banks
S. Subba Reddy: Agricultural Economics
Johl, S. S and Charles V. Moore: Essentials of Farm Financial Management
Kahlon, A. A. and Karam singh: Managing Agriculture Finance- Theory and Practice.

New Courses:

IPR 203 Intellectual Property Rights 1 (1+0)

Objective: To provide insights on importance of IPR and governing institutions

Course outcome: Upon completion of the course students will be able to;

- Explain the importance of IPR in agriculture.
- Categorize types of IPR and licensing procedure.
- Process application for IPR for an agricultural produce.
- Explain the importance of biodiversity and obtaining the IPR.

Theory

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc. Types of Intellectual Property and legislations covering IPR in India-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeder's rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmer's rights. Traditional knowledge-meaning and rights of TK holders.

Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Suggested Reading:

Acharya, N.K. 2014. Text book of Intellectual Property Rights. Asia Law House, Hyderabad.
Loganathan, E.T. 2012. Intellectual Property Rights. New Century Publications, New Delhi.
Rosedar, S.R.A. 2016. Intellectual Property Rights. Lexis Nexis (2nd Ed.), Nagpur.

ARP 305 Agriculture and Rural Development Programs in India 1 (1+0)

Objective: To provide insights on the growth and implementation of various rural development programs in India

Course outcome: Upon completion of the course students will be able to;

- Able to list various rural development programs and identify the suitable identify the beneficiaries.
- Understand the guidelines of each program and criterion to avail the program by the beneficiary.

- Able identify the institutions and functionaries implementing the program.

Theory

Rural Development, Infrastructure and Institutions, Rural Development through Voluntary Organizations during Pre-Independence Era, Agricultural Development Program, Employment Generation Program, Area Development Program, Social Development Program, Rural Development Program in Orissa.

CDM 604 e-Commerce and Digital Marketing 2 (1+1)

Objective: To provide insights on the recent developments of application of IoT in on-line marketing of agriculture based products.

Course outcome: Upon completion of the course students will be able to;

- Gained knowledge on the theoretical concepts involved in e-commerce and digital marketing.
- Acquainted with the use of internet for developing e-business, web designing, e-shopping models.
- Gained knowledge on the required logistics (software and hardware) components of the digital marketing.
- Gained analytical abilities to manage on digital marketing data and analytics to build retail and whole sale and service sector.

Theory

E-Business - Origin and Need of E-Commerce, Factors affecting E -Commerce, Business dimension and technological dimension of E-Commerce, E-Commerce frame work Electronic Commerce Models, Value Chains in Electronic Commerce. Internet and E-Business Introduction to Internet and its application, Intranet and Extranets. World Wide Web, Internet Architectures, Internet Applications, Business Applications on Internet, E - Shopping, Electronic Data Interchange, Components of Electronic Data Interchange, Creating Web Pages using HTML.

PART B Technology for Online Business: Internet, IT Infrastructure, Middleware Contents, Text and Integrating E-Business Applications, Mechanism of Making Payment Through Internet, Online Payment Mechanism, Electronic Payment Systems, Payment Gateways, Visitors to Website, Tools for Promoting Website, Plastic Money, Debit Card, Credit Card, Laws Relating to Online Transactions. Applications in E-commerce: E-commerce Applications in Manufacturing, Wholesale, Retail and Service Sector

Practical

1. Introduction to HTML: Elements of Web page (Text, Image & Hyperlink Elements), Html Tags, Using Tools, Structure of a page, Links & Navigation, Backgrounds, Animated Graphics
2. Working with Tables: Page Design & Layout with Link, Advanced Layout with Tables, Working Style Sheets, Forms & Frame: HTML Forms (<form> element, Form controls, creating labels for control, structuring forms, focus, sending form data to server), Using Frame (<frame>, <frameset> <noframes> element, creating links between frames, nested framesets)
3. Practical based on DHTML: Introduction to DHTML, Understanding DO, working with Layers, Drop Down, Menus, Text Effects and Animation, Web Supportive Formats & validating Html Code
4. Creating Graphical Objects: Drawing –lines, shapes, inserting–pictures, objects, tables, templates, adding special effects, exporting drawings, outlining & filling objects, inserting symbols & Clip arts, working in Corel draw presentation –adjusting the position, resizing, positioning, merging, color shades & shadows. working with advanced effects, special interactive effects, creating- business cards, pamphlets, banners, newspapers, books. Shortcut keys in Corel draw.
5. Practical lab based Database Management System and Structured Query Language: Retrieving data using the SQL select statement, Restricting and sorting data, Using single row function to customize output. Reporting aggregated data using the group function. Displaying data from multiple tables –I, Displaying data from multiple tables-II, Using sub queries to solve problems, Using set operators, Manipulating data, Using DDL statements to create and manage tables,

Creating other schema objects, Managing objects with data dictionary, Controlling User access, Managing schema objects, Manipulating large data sets, Generating report by grouping related data, Retrieving data using sub queries.

Suggested Readings:

Whitley, David, E-Commerce Strategy, Technologies and Applications, Tata McGraw Hill.
Schneider Gary P. and Perry, James T, Electronic Commerce., Thomson Learning.
Bajaj, Kamlesh K & Nag, Debjani, E-Commerce: The Cutting Edge of Business, , McGraw Hill
Laudon and Traver, E-Commerce: Business, Technology, Society, , Pearson Education
Treese G. Winfield & Stewart C. Lawrance, Designing Systems for Internet Commerce
Thomas A. Powell HTML: The complete reference
Patrick Carey and Mark Kemper, New perspectives on creating Web pages with HTML/DHTML

BSE 306 Biosafety and Bio-ethics 1 (1+0)

Objective: Provide insights on various aspects of biosafety regulations and bio-ethical concerns arising from the commercialization of products and process developed utilizing biotechnological tools.

Course outcome: Upon completion of the course students will be able to;

- Explain the difference between bio-safety and bioethics.
- Develop a method to safely handle hazardous biological materials in the laboratory.
- Understand the rules and regulation and governing bodies involved in biosafety and bio-ethics.
- Gained a detailed knowledge on biosafety issue related GM crops in agriculture.
- Gained knowledge on the national biosafety rules and regulatory framework, policies.

Theory

Introduction to bio-safety, Biosafety and risk assessment issues; Regulatory framework; National biosafety policies and law, The Cartagena protocol on biosafety, WTO and other international agreements related to biosafety, Cross border movement of germplasm; Risk management issues - containment.

General principles for the laboratory and environmental biosafety; Health aspects; toxicology, allergenicity, antibiotic resistance, etc. Impact on environment: gene flow in natural and artificial ecologies; Sources of gene escape, tolerance of target organisms, creation of super weeds/super viruses, etc.

Biosafety: Definition, Biosecurity: Definition, Bio weapons, Definition of Biohazard, Application to Use Biohazardous Materials, Laboratory Safety protocols, Classification of pathogens by risk group, Containment, Safe handling of biological spills, Sterilization and disinfection in the laboratories

Challenges in Animal Biosecurity, Poultry Biosecurity Issues, An awareness of trade issues and their relevance to agricultural biosecurity, An understanding of the foundation principles and basic practices of pest exclusion, eradication, and management tactics for invasive species, An appreciation of early detection and correct identification of new and emerging pest problems, An awareness of news and developments reported in the popular and scientific media, An awareness of the importance of insect vectors to animal and human health, An awareness of the importance of exotic animal disease threats to agriculture.

National Biosafety rules, Applications of National Biosafety rules, Establishment of National Biosafety rules, Functions of National Biosafety committee, Functions of technical advisory committee, Functions of institutional Biosafety committee, Prohibition and license requirement, Confidential information, Risk assessment and risk management, Decision making and communication of decision, Grant of license, Application of re-examination, Special requirement for import and export of living modified organisms, Agriculture pathogen biosafety, Integrated pest management.

Introduction to Ethical analysis of genetic modification, Genetic modification and risk factors, Possible misuse of genetic modification, Nanobiotechnology, Cybernetics, Applications of genetic modification and their ethical issues,

Ethical issues related to genetically modified food, Risk factors of GM food, Genetic modifications of animals and their uses, Genetic modifications of animals and their ethical issues. Ecological aspects of GMOs and impact on biodiversity; Monitoring strategies and methods for detecting transgenics; Benefits of transgenics to human health, society and the environment.

Personal protective equipment and clothing, plans for emergency preparedness and response, Introduction to the transport of infectious materials, Biosafety and recombinant DNA technology, Hazardous Chemicals, Safety checklist, first aid, Overview of Biosecurity risk assessment methodology, Evaluate the pathogens and toxins, Occupational Health

The WTO and other international agreements; Intellectual properties, copyrights, trademarks, trade secrets, patents, geographical indications, etc. Protection of plant variety and farmers right act; Indian patent act and amendments, patent filing; Convention on biological diversity; Implications of intellectual property rights on the commercialization of biotechnology products.

Suggested Readings

Shomini Parashar, Deepa Goel 2013. IPR, Biosafety and Bioethics
 Singh BD. 2007. Biotechnology: Expanding Horizon. Kalyani.
<http://patentoffice.nic.in>
www.wipo.org
www.dbtindia.nic.in
www.dbtbiosafety.nic.in

Experiential Learning Program (ELP) Modules

Objective: To provide hands on training in specific topic relevant agri-produce status and building business models

Course outcome: Upon completion of the course students will be able to;

- Acquired the analytical skills to examine the status of agri-produce statistics.
- Develop business plans and models.
- Advise entrepreneurs.

Production Management of Vegetable Crops	
1.	Importance and scope of vegetable crops.
2.	Present scenario of production in the World, India and State
3.	Production management techniques of selected vegetable crop
4.	Management of different input used for selected vegetable crop
5.	Estimation of cost cultivation of selected vegetable crop and income measures- net income, B:C ratio, per quintal cost of production, per hectare cost of cultivation, experience gained
6.	Summary and Conclusion

Marketing Management of Vegetable crops	
1.	Export scenario, procedure and documents required for the export
2.	Channel-wise marketing cost of the selected vegetable crop. Price spread and market margin
3.	Study Tour – Visit to APMC having selected crop has major arrival
4.	Collection of data for arrival and prices of vegetable crops and study of working guidelines of APMC
5.	Market and price support schemes of selected vegetable crop
6.	Experience gained
7.	Summary and Conclusion

Production Management of Floricultural Crops	
1.	Importance and scope of selected floricultural crop.

2.	Current scenario of production in world, India & State.
3.	Production management techniques of selected floriculture crop.
4.	Management of different input used for selected floriculture crop.
5.	Estimation of cost of cultivation of selected floriculture crop and income measures like; Net Income; B:C ratio; Per quintal cost of production; Per hectare cost of production
6.	Experience gained
7.	Summary and Conclusion

Marketing Management of Floricultural Enterprises	
1.	Present domestic & international market status of selected floriculture crop. Major producing regions and major consumption markets.
2.	Channel-wise marketing cost of the selected floriculture crop and market margin
3.	Export scenario, procedure and documents required for the export
4.	Market support & price support schemes for selected floriculture crop
5.	Study Tour – Visit to APMC having selected crop has major arrival.
6.	Experience gained.
7.	Summary and Conclusion

Production Management of Oilseed Crops	
1.	Importance and scope of oilseed crop.
2.	Current scenario of production in world, India & State
3.	Production management techniques of selected oilseed crop
4.	Management of different input used for selected oilseed crop
5.	Estimation of cost of cultivation of selected oilseed crop and income measures like; Net Income; B:C ratio; Per quintal cost of production; Per hectare cost of production
6.	Experience gained.
7.	Summary and Conclusion

Marketing Management of Oilseed crops	
1.	Present domestic & international market status of selected oilseed crop. Major producing regions and major consumption markets.
2.	Channel-wise marketing cost of the selected oilseed crop. Price spread and market margin
3.	Working out of payback period, break-even analysis
4.	Export scenario, procedure and documents required for the export
5.	Market support & price support schemes for selected oilseed crop
6.	Experience gained.
7.	Summary and Conclusion

Production Management of Pulse Crops	
1.	Importance and scope of pulse crops.
2.	Current scenario of production in world, India & State
3.	Production management techniques of selected pulse crop
4.	Management of different input used for selected pulse crop
5.	Estimation of cost of cultivation of selected pulse crop and income measures like; Net Income; B:C ratio; Per quintal cost of production; Per hectare cost of production.
6.	Experience gained.
7.	Summary and Conclusion

Marketing Management of Pulse Crops	
1.	Present domestic & international market status of selected pulse crop. Major producing regions and major consumption markets
2.	Channel-wise marketing cost of the selected pulse crop and market margin
3.	Export scenario, procedure and documents required for the export
4.	Market support & price support schemes for selected pulse crop
5.	Study tour – Visit to APMC having selected crop as major arrival.
6.	Experience gained.

7.	Summary and Conclusion
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Production Management of Dairy Enterprises	
1.	Present scenario
2.	Procedure and Documents required for starting unit
3.	Management systems and Process in selected unit
4.	Resource Use Management: Site, Land, Water, Raw Materials, Capital, Manpower, Equipment's, Energy, Electricity supply, Veterinary aids.
5.	Human Resource Management: Planning, Acquisition, Training, Monitoring, Payments, Rewards.
6.	Raw material, Work in Process, product. account and control.
7.	Supply chain Management: Procurement Management, Distribution Management.
8.	Quality Management
9.	Cost analysis of unit: Total annual fixed cost = Land rent + Depreciation + Interest on fixed capital Total annual variable cost: Raw Material cost+ Fuel cost+ Labour cost + Transportation cost+ Packing cost+ Other (Miscellaneous expenses)
10.	Experience gained.
11.	Summary and Conclusion

Marketing Management of Dairy Enterprises	
1.	Marketing management: Marketing functions – Assembling, Grading, Packing, Storage, Transportation
2.	Distribution management of milk, marketing channels
3.	Estimation of marketing cost & margins, price spread
4.	Calculation of financial ratios: B:C ratio, Turnover ratio, Profitability ratio.
5.	Study tour - Visit to milk market, collection center, retail outlet, large scale commercial dairy farms etc.
6.	Problems & suggestions
7.	Experience gained.
8.	Summary and Conclusion

Production Management of Poultry Enterprises	
1.	General information
2.	Procedure and Documents required for starting unit
3.	Management systems and Process in selected unit
4.	Resource Use Management: Site, Land, Water, Raw
5.	Materials, Capital, Manpower, Equipment's, Energy, Electricity supply, Veterinary aids.
6.	Human Resource Management: Planning, Acquisition, Training, Monitoring, Payments, Rewards.
7.	Raw material, Work in Process, Finished product. Inventory account and control.
8.	Supply chain Management: Procurement Management, Distribution Management.
9.	Quality Management
10.	Cost analysis of unit: Total annual fixed cost = Land rent + Depreciation + Interest on fixed capital; Total annual variable cost: Raw Material cost+ Fuel cost+ Labour cost + Transportation cost+ Packing cost+ Other (Miscellaneous expenses)
11.	Break even analysis
12.	Experience gained
13.	Summary and Conclusion

Marketing Management of Poultry Enterprises	
1.	Marketing management: Marketing functions – Assembling, Grading, Packing, Storage,
2.	Transportation
3.	Distribution management of egg/birds, marketing channels
4.	Estimation of marketing cost & margins, price spread
5.	Calculation of financial ratios: B: C ratio, Liquidity ratios, Turnover ratio, & profitability ratio.
6.	Study Tour -Visit to poultry market, processing unit, retail outlet, large scale commercial poultry farms etc.
7.	Problems & suggestions
8.	Experience gained

Experiential Learning Program (ELP) Modules:**Production Management of Vegetable Crops**

1. Importance of vegetable crops, current scenario in world, India & state
2. Production management techniques & management of different inputs.
3. Estimation of cost of cultivation and various efficiency & income measures.
4. Summary and Conclusion

Marketing Management of Vegetable Crops

1. Study of channels of marketing, major markets of vegetable crops.
2. Distribution management and critical aspects of marketing
3. Estimation of marketing cost, margins & various ratios.
4. Market support and price stabilization measures by government
5. Summary and Conclusion

Production Management of Floricultural Crops

1. Importance of floricultural crops, current scenario in world, India & state
2. Production management techniques & management of different inputs.
3. Estimation of cost of cultivation and various efficiency & income measures.
4. Summary and Conclusion

Marketing Management of Floricultural Crops

1. Study of channels of marketing, major markets of floricultural crops.
2. Distribution management and critical aspects of marketing
3. Estimation of marketing cost, margins & various ratios.
4. Market support and price stabilization measures by government
5. Summary and Conclusion

Production Management of Oilseed Crops

1. Importance of oilseed crops, current scenario in world, India & state
2. Production management techniques & management of different inputs.
3. Estimation of cost of cultivation and various efficiency & income measures.
4. Summary and Conclusion

Marketing Management of Oilseed Crops

1. Study of channels of marketing, major markets of oilseed crops.
2. Distribution management and critical aspects of marketing
3. Estimation of marketing cost, margins & various ratios.
4. Market support and price stabilization measures by government
5. Summary and Conclusion

Production Management of Pulse Crops

1. Importance of pulse crops, current scenario in world, India & state
2. Production management techniques & management of different inputs.
3. Estimation of cost of cultivation and various efficiency & income measures.
4. Summary and Conclusion

Marketing Management of Pulse Crops

1. Study of channels of marketing, major markets of Pulse crops.
2. Distribution management and critical aspects of marketing
3. Estimation of marketing cost, margins & various ratios.
4. Market support and price stabilization measures by government
5. Summary and Conclusion

Production Management of Dairy Enterprises

1. Importance and Present Scenario of dairy industry in Odisha, India and World.
2. Study of Critical Areas of Management in dairy unit.
3. Estimation of maintains cost & per liter Cost of Production in dairy unit
4. Analysis of Economic Viability of dairy unit.
5. Summary and Conclusion

Marketing Management of Dairy Enterprises

1. Study marketing function performed in marketing of milk
2. Distribution management and critical aspects of marketing
3. Estimation of marketing cost, margins & various ratios.
4. Summary and Conclusion

Production Management of Poultry Enterprises

1. Importance and Present Scenario of poultry industry in India and World.
2. Study of Critical Areas of Management in poultry unit.
3. Estimation of Cost of Production in poultry unit
4. Analysis of Economic Viability of poultry unit.
5. Summary and Conclusion

Marketing Management of Poultry Enterprises

1. Study marketing function performed in marketing of eggs/birds.
2. Distribution management and critical aspects of marketing
3. Estimation of marketing cost, margins & various ratios.
4. Summary and Conclusion

Study tour to measure market centers related to selected experiential learning modules

Agro-Industry Internship Attachment (AIA)

	Title	Credits
1.	Agro-Industry Internship	0+20=20
	Total credits	0+20=20

1	Topics
2	Survey of Agro Based Industries in the region
3	Selection of Agro Based Industry
4	Features and general information of selected Agro Based Industry
5	Documentations Required and Procedure for establishment of selected Agro Based Industry/unit
6	Management System and Processes in Selected Agro based Industry/unit.
7	Organizational Structure and processes in Selected Agro based Industry/unit.
8	Identification of critical management areas in selected Agro Based Industry/unit
9	Strategic Management in selected Agro Based Industry/unit: Strategic Management Process: Vision, Mission, Objectives, Goals, Environmental and Organizational analysis, Strategic alternatives, Choice of Strategy, Implementation of Strategy, Evaluation and control.
10	Human Resource Planning: Forecasting Inventorying, Anticipating Planning, Job Analysis.

	Human Resource Acquisition: - Recruitment, Selection, Placement, Induction, Socialization.
11	Human Resource Development: - Training, Career Management, Monitoring and Performance coaching,
12	Team building. Compensation Strategy and Reward Management Industrial Relation.
13	Resource use Management in Selected Agro based Industry/unit: Raw Materials, Capital, Manpower, Machinery and Equipment, Energy, Site.
14	Processing Management in selected Agro Based Industry/unit: Process Flow Chart, Technical Aspects
15	Inventory Management in selected Agro Based Industry /Unit: Raw materials, Work in Process, Finished product, Inventory Account and control.
16	Total Quality Management in selected Agro Based Industry/unit: Operation Management, Quality improvement, Quality Assurance, Quality Policy.
17	By product Management in selected Agro Based Industry/unit: Marketing management in selected Agro based industry, Marketing function management: Assembling, Transportation, Packaging, Storage, Sale, promotion, Distribution. Marketing Mix Strategy: Product Strategy, Pricing strategy, Distribution Strategy, Communication Strategy.
18	Supply chain Management in Selected Agro Based Industry: Procurement Management, Distribution Management
19	Estimation of Cost of Production of selected agro based industry: Total Variable Cost: Raw Material Cost, Fuel Cost, Labour Cost, Transportation Cost, Packing Cost, Other (Light bill, Stationary etc.), Total Fixed Cost: Land rent, Depreciation, Interest on Fixed Capital, Total Cost = Total Variable Cost + Total Fixed Cost, B:C Ratio, Liquidity Ratio, Turnover Ratio, Profitability Ratio
20	Financial Management of selected agro based industry, Sources of Funds, Allocation of Funds, Financial feasibility, Break-Even Analysis
21	SWOT Analysis of selected Agro Based Industry unit - Strength, Weakness, Opportunities and Threats
22	Experience gained
23	Summary and Conclusion

WEEK 1

- Registration
- Orientation

WEEK 2

- Survey of Agro Based Industries in the region
- Selection of Agro Based Industry
- Features and general information of selected Agro Based Industry

WEEK 3

- Documentations Required and Procedure for establishment of selected Agro Based Industry/unit
- Management System and Processes in Selected Agro based Industry/unit
- Organizational Structure and processes in Selected Agro based Industry/unit
- Identification of critical management areas in selected Agro Based Industry/unit
- Processing Management in selected Agro Based Industry/unit.
- Process Flow Chart, Technical Aspects

WEEK 4

- Strategic Management in selected Agro Based Industry/unit
- Strategic Management Process: Vision, Mission, Objectives, Goals,

- Environmental and organizational analysis, Strategic alternatives,
- Choice of Strategy, Implementation of Strategy, Evaluation and control.

WEEK 5

- Resource Use Management in Selected Agro based Industry/unit.
- Raw Materials, Capital, Manpower, Machinery and Equipment, Energy, Site.

WEEK 6

- Human Resource Planning: Forecasting Inventorying, Anticipating
- Planning, Job Analysis.
- Human Resource Acquisition: - Recruitment, Selection, Placement, Induction, Socialization.
- Human Resource Development: - Training, Career Management, Monitoring and Performance coaching, Team building.
- Compensation Strategy and Reward Management, Industrial Relation

WEEK 7

- Inventory Management in selected Agro Based Industry/unit
- Raw materials, Work in Process, Finished product.
- Inventory Account and control.

WEEK 8

- Visit to Govt. Institutes like District Industrial Centre, Wholesale Markets of Raw Material.
- Arranging Guest Lectures related to Export, Finance, Experts related to Rules & Regulation.
- Presentation on work done till date.

WEEK 9

- Total Quality Management in selected Agro Based Industry/unit
- Operation Management, Quality improvement, Quality Assurance,
- Quality Policy.

WEEK 10

- By product Management in selected Agro Based Industry/unit

WEEK 11

- SWOT Analysis of selected Agro Based Industry/unit
- Strength, Weakness, Opportunities and Threats

WEEK 12

- Estimation of Cost of Production of selected agro based industry
- Total Variable Cost- Raw Material Cost, Fuel Cost, Labour Cost,
- Transportation Cost, Packing Cost, Other (Light bill, Stationary etc.),
- Total Fixed Cost: Land rent, Depreciation, Interest on Fixed Capital,
- Total Cost = Total Variable Cost + Total Fixed Cost
- B:C Ratio, Liquidity Ratio, Turnover Ratio, Profitability Ratio

WEEK 13

- Financial Management of selected agro based industry
- Sources of Funds
- Allocation of Funds
- Financial feasibility
- Break - Even Analysis

WEEK 14

- Marketing management in selected Agro based industry
- Marketing function management: Assembling, Transportation,
- Packaging, Storage, Sale promotion, Distribution.
- Marketing Mix Strategy: - Product Strategy, Pricing strategy,
- Distribution Strategy, Communication Strategy.

WEEK 15

- Supply chain Management in Selected Agro Based Industry:
- Procurement Management, Distribution Management

WEEK 16

- Experience gained (Agribusiness management)
- Summary and Conclusion (Agribusiness management)

WEEK 17

- Study Tour
 - Visit to Institutes like CFTRI (Mysore), Packaging industry, Pack house Cold Storage

WEEK 18 and WEEK 19

- Preparation of Project Reports
- Evaluation

