

Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I Agriculture University, Jodhpur

(Elective/ experiential learning courses)

Group	Course No.	Course Title	Credits
Crop Production and Allied Disciplines	PBG-4411	Advanced Seed Technology	3(1+2)
	AGRON-4411	Applied Weed Management	3(1+2)
	SCHEM-4411	Vermi-composting and Organic Farming	3(1+2)
	SCHEM-4412	Soil , Plant and Water Analysis	3(1+2)
	SCHEM-4413	Soil Management	3(1+2)
	AP-4411	Dairy Cattle Production	3(1+2)
	PPHYS-4411	Plant Growth Regulators in Agriculture	3(1+2)
	AENGG-4411	Plasticulture in Agriculture	3(1+2)
Plant Sciences and Plant Protection	PBG-4411	Advanced Seed Technology	3(1+2)
	PBG-4412	Tissue Culture and Micro-propagation Techniques	3(1+2)
	PPATH-4411	Bio-agents and Integrated Disease Management	3(1+2)
	PPATH-4412	Detection and Management of seed borne Pathogens	3(1+2)
	ENTO-4411	Non-insect Pests and Their Management	3(1+2)
	ENTO-4412	Bio-control agents and Bio-pesticides	3(1+2)
	PPHYS-4411	Plant Growth Regulators in Agriculture	3(1+2)
	NEMAT-4411	Economic Nematology	3(1+2)
Horticulture and Allied Sciences	ENTO-4412	Bio-control agents and Bio-pesticides	3(1+2)
	SCHEM-4411	Vermi-composting and Organic Farming	3(1+2)
	PBG-4412	Tissue Culture and Micro-propagation Techniques	3(1+2)
	AENGG-4411	Plasticulture in Agriculture	3(1+2)
	HORT-4411	Nursery Management of Horticultural Crops	3(1+2)
	HORT-4412	Commercial Vegetable Production	3(1+2)
	HORT-4413	Commercial Fruit Production	3(1+2)
	PPHYS-4411	Plant Growth Regulators in Agriculture	3(1+2)
Social Sciences	AECON-4411	Marketing Management	3(2+1)
	AECON-4412	Project Formulation, Evaluation and Monitoring	3(1+2)
	AECON-4413	Natural Resource Economics and Management	3(2+1)
	EXTED-4411	Visuals and Graphic Communication	3(1+2)
	EXTED-4412	Government Policies and Programmes on Agriculture	3(1+2)
	STAT-4411	Sampling Techniques	3(1+2)
	AP-4411	Dairy Cattle Production	3(1+2)
	AP-4412	Poultry Production and Management	3(1+2)

Note- A student shall be required to offer six courses of 18 credits out of the eight listed in any one of the groups. The individual college will have an option to offer six course(s) out of the groups to be offered. The student can offer courses from a single group only for which he/she shall be required to submit preferences for these groups and no *inter-alia* group courses will be permitted.

Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

AGRON- 4411

Applied Weed Management

3(1+2)

Theory:

Weed: definition, damages caused; Elements of weed prevention and control; Concept of Integrated weed management; Physical weed control methods: manual, mechanical and soil solarization; Weed control through agronomic practices; Biological weed control: Classical approach and bio-herbicides, Herbicidal control; Classes and methods of herbicide application; Sprayers: components and calibration. Weed management in field crops viz., paddy, wheat, maize and millets, groundnut, linseed, rapeseed and mustard, soybean, chickpea, pigeonpea, lentil, sugarcane, cotton, cumin, fenugreek, Lucerne, berseem and vegetable crops; Control of parasitic weeds viz, *Striga*, *Orobanchae*, *Cuscutta*, and *Loranthus*.

Practical:

Identification and preservation of seasonal and perennial weeds; Practice in manual and mechanical weed control and use of improved implements; Acquaintance with herbicides – their manufacturers and potential uses; Visit to weed control trials to record observations on density, intensity and dry matter; Herbicide application equipments and their calibration; Herbicide calculations; Herbicide spray in cropped and non-cropped area; Recording herbicide toxicity; Economics of weed control; Qualitative and quantitative analysis of weedy vegetation; Bioassay for herbicide residue estimation; Control of *Parthenium hysterophorus*; Visits to observe weed problems on farmers fields and aquatic ecosystem.

Suggested Readings:

1. Saraswat, V.N., Bhan, V.M. and Yaduraju, N.T. 2003. Weed Management, ICAR, New-Delhi.
2. Gupta, O.P. 2005. Weed Management: Principles and Practices (2nd Ed.), Agribios (India), Jodhpur.
3. Shanmugavelu, K.G., Aravindan, R. and Rajagopal, A. 2004. Weed Management in Horticultural Crops, Agrobios (India), Jodhpur.
4. Gupta, O.P. 2008. Modern Weed Management, Agribios (India), Jodhpur
5. Das, T.K. 2008. Weed Science: Basics and Applications, Jain Brothers, New-Delhi.



Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

AGENGG-4411

Plasticulture in Agriculture

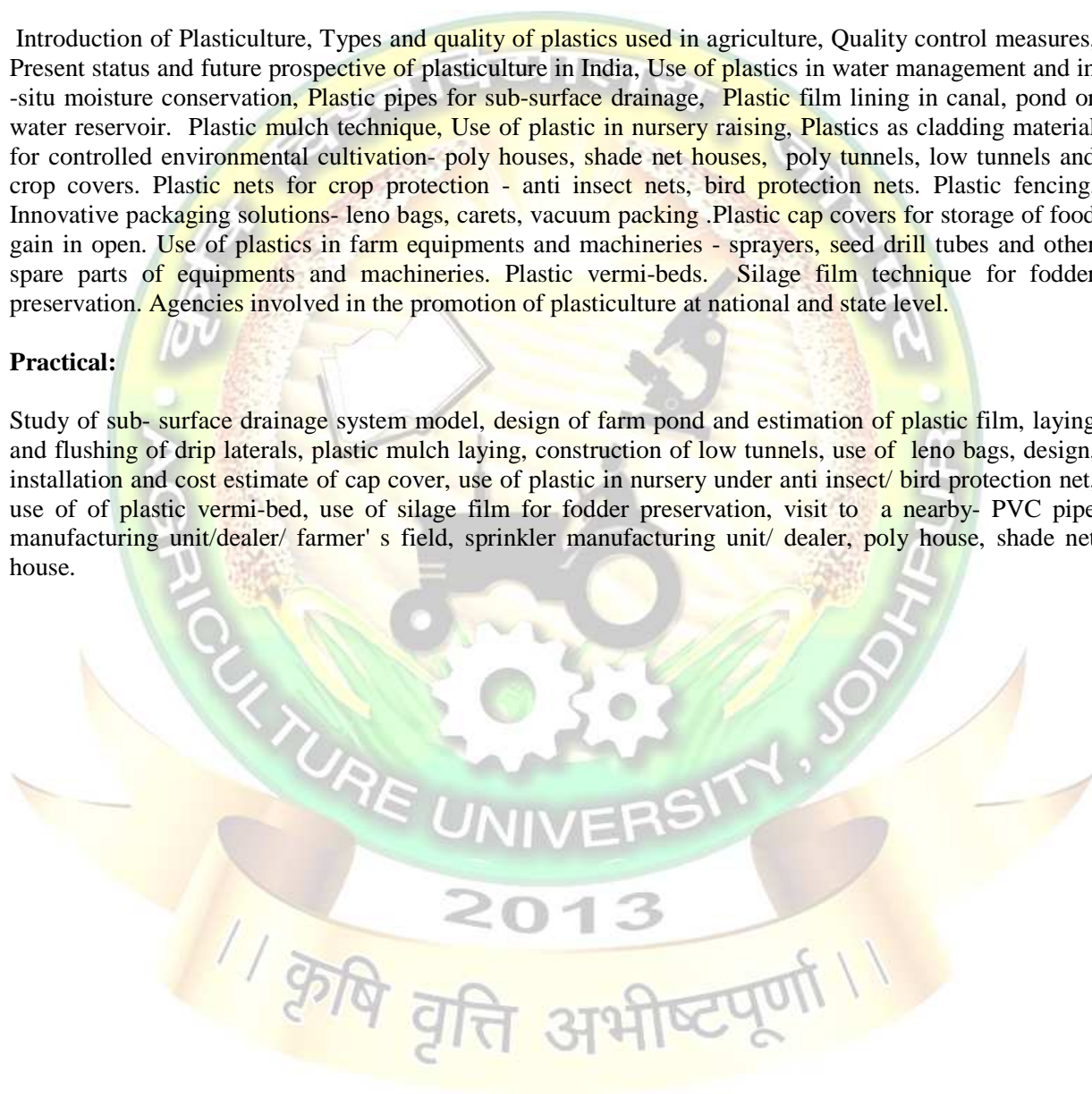
3(1+2)

Theory:

Introduction of Plasticulture, Types and quality of plastics used in agriculture, Quality control measures, Present status and future prospective of plasticulture in India, Use of plastics in water management and in-situ moisture conservation, Plastic pipes for sub-surface drainage, Plastic film lining in canal, pond or water reservoir. Plastic mulch technique, Use of plastic in nursery raising, Plastics as cladding material for controlled environmental cultivation- poly houses, shade net houses, poly tunnels, low tunnels and crop covers. Plastic nets for crop protection - anti insect nets, bird protection nets. Plastic fencing. Innovative packaging solutions- leno bags, carets, vacuum packing .Plastic cap covers for storage of food grain in open. Use of plastics in farm equipments and machineries - sprayers, seed drill tubes and other spare parts of equipments and machineries. Plastic vermi-beds. Silage film technique for fodder preservation. Agencies involved in the promotion of plasticulture at national and state level.

Practical:

Study of sub- surface drainage system model, design of farm pond and estimation of plastic film, laying and flushing of drip laterals, plastic mulch laying, construction of low tunnels, use of leno bags, design, installation and cost estimate of cap cover, use of plastic in nursery under anti insect/ bird protection net, use of of plastic vermi-bed, use of silage film for fodder preservation, visit to a nearby- PVC pipe manufacturing unit/dealer/ farmer' s field, sprinkler manufacturing unit/ dealer, poly house, shade net house.



Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

ENTO - 4412

Bio control agents and Bio pesticides

3 (1+2)

Theory:

Definition, concept and principles of biological control. Attributes of an effective natural enemies. Types of natural enemies- Parasitoids and predators. Techniques of biological control. Microbial control- Pathogenicity, virulence and factors that enhance the use of microorganisms. Classification, mode of action and uses of microbial agents, factors influencing their effectiveness. Advantages and limitations of biological control in IPM. Role of biological control in IPM. Mass production and multiplication of biocontrol agents- viruses, bacteria, fungi and parasitoids and predators and their application techniques. Potential of plant products in IPM.

Practical:

Handling, maintenance and upkeep of equipments related to biological control. Identification of important biological agents. Mass rearing techniques of important host insects of parasitoids (one field and one storage Lepidopteran pest). Mass rearing techniques and inundative release of important parasitoids- *Trichogramma* sp./ *Campoletis chloridae*. Mass rearing technique of important predators- Lady bird beetle and green lacewing. Collection and preservation of bio-agents. Mass production of NPV, Bt and *Metarrhizium anisopliae*. Field visit to study the behavior of natural enemies and their collection. Visits of mass production and biological control centers of national repute. Preparation of neem seed kernel extract.

Suggested Readings:

- 1 DeBach, P. 1974. Biological control by Natural enemies. Cambridge University Press. Manfred Mackaur,
- 2 Laster E. Ehler and Jens Roland. 1990. Critical Issues in Biological control- Intercept Ltd.
- 3 Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin -4.
- 4 Rabindra, R.J., Kennedy, J.S., Sathaiyah, N., Rajasekharan, B. and Srinivasan, M.R. 2001. Microbial control of crop pests. TNAU.
- 5 Dhaliwal GS & Arora R. 2001. Integrated Pest Management: Concepts and Approaches. Kalyani Publ., New Delhi.
- 6 Dhaliwal, GS & Koul O. 2007. Biopesticides and Pest Management. Kalyani Publ., New Delhi.
- 7 Gautam, R.D. Biological Pest Suppression, Westvill Publishing Co., New Delhi.

Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

ENTO- 4411

Non-Insect Pests and Their Management

3 (1+2)

Theory:

Rodents: Rodent pests of agricultural importance. Field and storage losses due to rodents. Taxonomy, distribution, habitat behavior, burrowing pattern and breeding potential. Methods of rodent management in field and godowns- mechanical, physical, biological, chemical (rodenticides, fumigants etc.). Bait shyness and bait preference,. Other methods- sanitation, rodent proof structures, electromagnetic repellents etc. **Agricultural Ornithology:** Important phytophagous bird species in India, potential losses, host range, feeding behaviour and management. **Snails and Slugs:** Important species of agricultural importance. **Mammal pests:** Major mammals of agricultural importance, nature of damage and management. **Phytophagous mites:** General morphology and biology. Important species of mites of Agricultural importance (*Petrobia latens*, *Larvacarus transitans*, *Eutetranychus orientalis* and *Tetranychus cinnabarinus*), nature and extent of damage and their management.

Practical:

Identification of important rodent species in different habitats. Burrow patterns and feeding habits of important rodent species. Assessment and monitoring rodent pest population. Study of rodenticides Study of mechanical method of rodent control Pre-baiting, baiting and their application. Fumigation of burrows. Rodent management in field crops, threshing floors and godowns. Placement of baits, evaluation and efficacy of baits. Organization of rodent control campaigns. Identification and food habits of birds associated with agricultural crops. Crop protection measures for birds: traditional and modern methods. Study of external morphology of phytophagous mite species. Diagnostic study of symptoms caused by different groups of mites on different crops. Study of different acaricides. Study of major mammalian pests. Study of snails and slugs. Visit to zoological museum.

Suggested Readings:

1. Barnes, Edwin, H. 1981. The birds of India: A guide to Indian Ornithology, Cosmo publication, New Delhi.
2. Bhargava, M.C. and Kumawat, K.C. 2010. Pests of stored grains and their management, New India Publishing Agency, New Delhi.
3. Iswar Prakash, 1992. Rodents in Indian Agriculture, Vol. 1. Scientific Publishers, Jodhpur.

Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

EXTED-4412

Government Policies and Programmes on Agriculture

3(1+2)

Theory:

Indian situation of Agriculture at a glance. Issues and challenges in agricultural development in India. National Policy for Agricultural development since independence: Development programmes for agriculture with reference to year of start, objectives and salient features. Research, extension and teaching mechanism at national and state level with reference to agriculture, Public-Private Partnership.

Practical :

Preparation of interview schedule for conducting bench mark survey with special reference to demographic information of a nearby village. Visit of KVK / voluntary organization to study developmental activities related to agriculture. Field visit to a successful agriculture related enterprise. Study the functioning of State Department of Agriculture. Evaluation of any ongoing agricultural development programme. Social auditing of MNREGA.

Suggested Readings:

1. Subhalakshmi V. 2005. Globalization- Indian Experience. ICFAI Univ. Press, Hyderabad.
2. Bagchi J. 2007. Agriculture and WTO opportunity for India. Sanskruti.
3. John KC, Sharma DK, Rajan CS and Singh C. 1997. Farmers Participation in Agricultural Research and Extension Systems. MANAGE, Concept Publi. Co.
4. Narasaiah ML. 2005. Agricultural Development and world Trade organization. Discovery Publ.
5. Dunn DD. 1978. Appropriate Technology with a Human Face. Mecomillan Press.
6. Kapoor SK, Roy PB & Roy AK. 1980. Role of Information centers in Technology Transfer. IASLIC, Kolakata.
7. Lekhi RK. 1984. Technological Revolution in Agriculture. Classical Publ. Co.
8. Ray GL. 2006. Extension Communication and management. Kalayani Publ.
9. Supe SV. 2009. A Text Book of Extension Education. Agrotech Publishing Academy, Udaipur.
10. Viswanathan M. 1994. Women in Agriculture and Rural Development. Printwell Publ.

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Syllabus
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Agriculture University, Jodhpur

EXTED-4411

Visuals & Graphic Communication

3(1+2)

Theory:

Role of visuals & graphics in Communication. Characteristics of visuals & graphics. Functions of visuals and graphics. Classification and selection of visuals. Designing message for visuals and Graphics. Principles and production of low cost visuals like charts, posters, flash cards, exhibits, photographs slides and PC based visuals. Multimedia production. Preparation and presentation of multimedia slides. Pre-testing and evaluation of visuals. Scanning of visuals.

Practical:

Preparation of low cost projected and Non-Projected visuals. Designing and layout of charts, posters, flash cards etc. Power point presentations. Generating computer aided presentation graphics. Scanning and evaluation of visuals.

Suggested Readings:

1. Bhatia A. 2005. Visual Communication. Rajat Publications, New Delhi.
2. Edgar Dale 1970. Audio Visual methods in Teaching. Holt, Rinehart & Winston.
3. James WB, Richard BL, Fried F Harclerod. 1952. A.V. Instructional Material & Methods. Mc.Graw Hill.
4. Reddy YN. 1998. Audio Visual Aids in Teaching, Training and Extension. Haritha Publ. House, Hyderabad.



Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

HORT- 4411

Nursery Management of Horticultural Crops

3(1+2)

Theory:

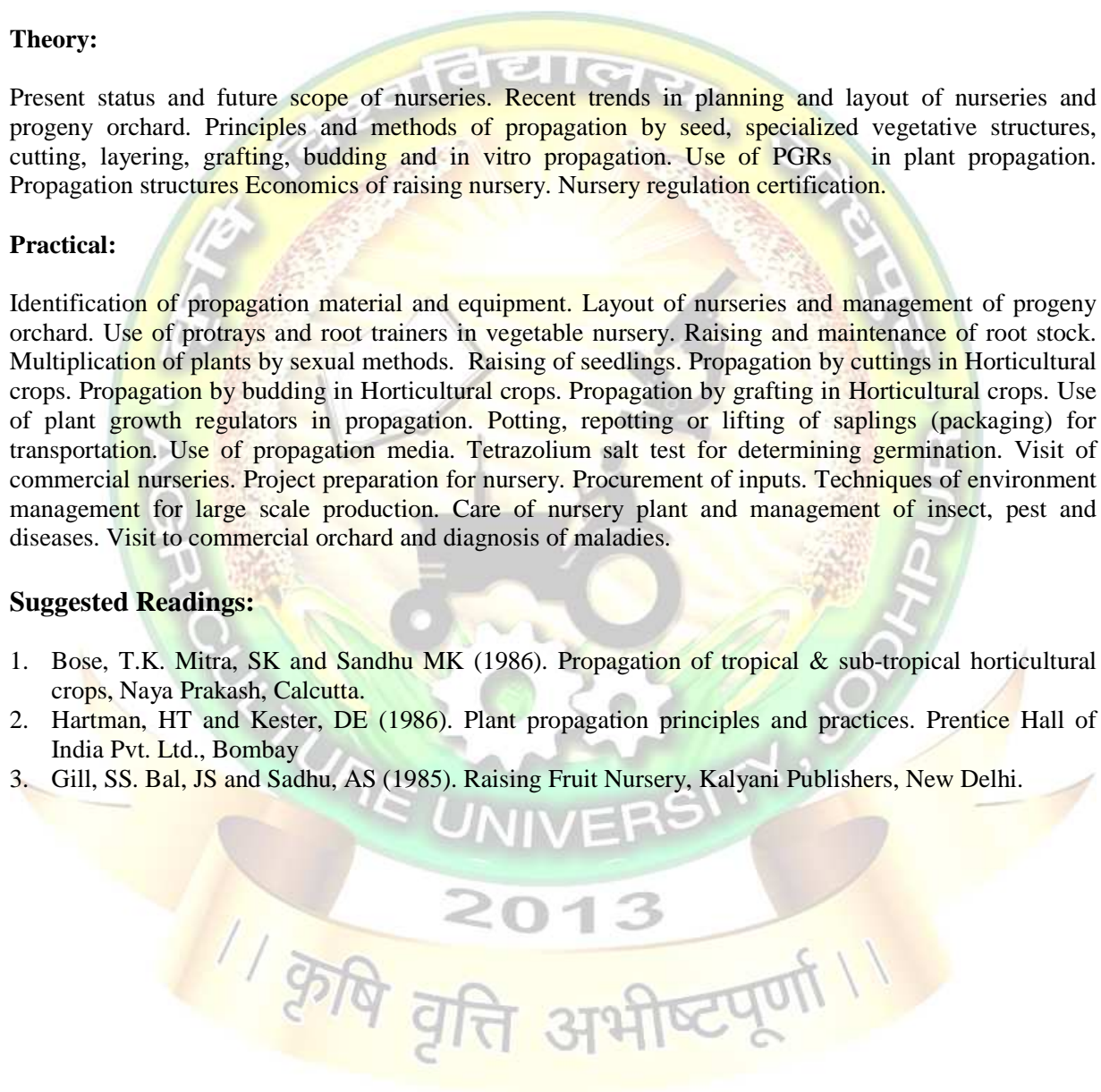
Present status and future scope of nurseries. Recent trends in planning and layout of nurseries and progeny orchard. Principles and methods of propagation by seed, specialized vegetative structures, cutting, layering, grafting, budding and in vitro propagation. Use of PGRs in plant propagation. Propagation structures Economics of raising nursery. Nursery regulation certification.

Practical:

Identification of propagation material and equipment. Layout of nurseries and management of progeny orchard. Use of protrays and root trainers in vegetable nursery. Raising and maintenance of root stock. Multiplication of plants by sexual methods. Raising of seedlings. Propagation by cuttings in Horticultural crops. Propagation by budding in Horticultural crops. Propagation by grafting in Horticultural crops. Use of plant growth regulators in propagation. Potting, repotting or lifting of saplings (packaging) for transportation. Use of propagation media. Tetrazolium salt test for determining germination. Visit of commercial nurseries. Project preparation for nursery. Procurement of inputs. Techniques of environment management for large scale production. Care of nursery plant and management of insect, pest and diseases. Visit to commercial orchard and diagnosis of maladies.

Suggested Readings:

1. Bose, T.K. Mitra, SK and Sandhu MK (1986). Propagation of tropical & sub-tropical horticultural crops, Naya Prakash, Calcutta.
2. Hartman, HT and Kester, DE (1986). Plant propagation principles and practices. Prentice Hall of India Pvt. Ltd., Bombay
3. Gill, SS. Bal, JS and Sadhu, AS (1985). Raising Fruit Nursery, Kalyani Publishers, New Delhi.



Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

HORT-4412

Commercial Vegetable Production

3(1+2)

Theory:

Importance, scope and export potential of commercial vegetables in India. Importance, origin, history, area, distribution, taxonomy, recent trends of the commercial vegetables. F₁- hybrids, commercial varieties, nutritional requirement, irrigation, intercultural-operations, weed control, mulching, plant protection of important commercial vegetables, solanaceous, Okra, bulb crops, cucurbits, cowpea, amaranthus & cluster bean. Off season cultivation of important commercial vegetables. Organic Vegetable Production.

Practical:

Identification and botanical description of important commercial vegetables, their varieties & seeds. Estimation of viability and germination percentage and real value of seeds. Practice of emasculation, selfing and crossing in various vegetable crops. Seed production in root crops, cauliflower, onion, tomato and cucurbits. Planting of roots of Radish, Carrot & Turnip for seed production. Preparation of cropping scheme for commercial vegetable grower/farms. Preparation of Nursery beds, seed treatment and sowing of seeds in beds. Sowing of seeds in polythene bags/pro-trays. Pro-trays seedling preparation & management in Net house. Transplanting of seedlings, sowing of cucurbits in field. Growing of vegetables with drip irrigation methods. Use of plastic mulch in vegetable production. Application of manures-fertilizers, liquid fertilizers & nutrient spray in vegetable crops. Inter cultural operations in Vegetable crops. Spray of pesticides, fungicides & use of PGRs. Study of Physiological disorders in Vegetables. Study of maturity standards & harvesting. Seed extraction techniques. Pre cooling, washing, grading, packaging & storage of vegetable crops. Calculation of cost of production and B/C ratio. Identification of Major Pests, Diseases & Disorders. Study of storage techniques of vegetable crops.

Suggested Readings:

1. Chadha, K.L. & Kauloo, G. advances in Horticulture. Vol.5 & 6. Vegetable Crops; Malhotra Publishing House, New Delhi.
2. Chaudhary, B. 1996. Vegetables, NBT, New Delhi
3. Bose, T.K., Kabir, I., Maity, T.K., Parthasarthy, V.A. & Sons, M.G. 2006, Vegetable Crops. Vol.I,II & III (IIIrd revised edition).
4. Singh, S.P. 1989. Production technology of Vegetable crops. Agril. Research, Communication Centre, Karnal.

Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

HORT. 4413

Commercial Fruit Production

3(1+2)

Theory:

Importance, present position and scope of fruit production. Classification, systematic study of fruits, Importance, origin, history, area, distribution and recent trends in the production technology of commercial fruit crops viz. Guava, Citrus, Mango, Beal, Ber, Aonla, Lehsua, Pomegranate, Papaya, Grapes and Date palm.

Practical:

Identification of important sub tropical and tropical fruits. Lay out of orchards. Different types of planting methods including high density planting and meadow orcharding. Preparation of soil mixture for nursery bed. Identification and uses of horticultural tools. Raising of rootstock. Practices on stratification and scarification of fruit seeds. Soil sterilization of nursery . Irrigation methods of fruits orchards with the emphasis on micro irrigation. Methods of fertilizer application of fruit crops and fertigation. Use of PGRs in fruit crops. Various methods of plant protection. Vegetative methods of propagation. Demonstration of different training methods. Demonstration of different pruning methods. Methods of moisture conservation and weed control in various fruit crops. Study of physiological disorders of fruit crops. Study of nutrient deficiency symptoms of fruit crops. Study of maturity indices of fruit crops. Calculation of water or irrigation requirement of fruit crops based on CPE. Visit to different fruit orchards of local region. Cost of cultivation of ber, Aonla, mango, kinnow, papaya etc. Pollination in date palm.



Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

PPATH- 4411

Bioagents and Integrated Disease Management

3(1+2)

Theory:

Introduction, definition and concepts of Integrated Disease Management. Components of IDM- physical, chemical, cultural, biocontrol, resistance and legislative methods. Different biocontrol agents- Trichoderma, Pseudomonas and Bacillus. Mass production of bioagents. Mechanism of action of biocontrol agents. Methods of application of bioagents. IDM in important crops - rice, wheat, cotton, rapeseed and mustard, chickpea, groundnut and potato.

Practical:

Preparation of culture media for fungi and bacteria. Isolation and purification of antagonistic fungi and bacteria from rhizosphere soil. In vitro evaluation of antagonism against pathogens. Mass multiplication of bioagents (Trichoderma, Pseudomonas, Bacillus spp.) in different liquid and solid media. Evaluation of fungitoxicity against pathogens. Bioefficacy of antagonists against important pathogens. Visit to biopesticide production units.

Suggested Readings:

1. Campbell, R. 1989. Biological Control of Microbial Plant Pathogens. Cambridge Univ. Press, Cambridge.
2. Cook, R.J. and Baker, K.F. 1983. Nature and Practice of Biological Control of Plant Pathogens. APS, St. Paul, Minnesota.
3. Gupta, V.K. and Sharma, R.C. (Eds.). 1995. Integrated Disease Management and Plant Health. Scientific Publ., Jodhpur.
4. Mayee, C.D., Manoharachary, C., Tilak, KVBR., Mukadam, D.S and Deshpande Jayashree (Eds.). 2004. Biotechnological Approaches for the Integrated Management of Crop Diseases. Daya Publ. House, New Delhi.
5. Mukherjee, K.G., Tewari J.P., Arora, D.K. and Saxena, G. 1992. Recent Developments in Biocontrol of Plant Diseases. Aditya Books, New Delhi.
6. Nene, Y.L. and Thapliyal, P.N. 1993. Fungicides in Plant Disease Control. 3rd Ed., Oxford & IBH, New Delhi.
7. Singh, R.S. (2000). Plant Disease Management. Oxford and IBH, NewDelhi.

Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

PPATH- 4412

Detection and Management of Seed-Borne Pathogens

3(1+2)

Theory:

Importance of seed-borne diseases. A brief account of seed-borne fungal, bacterial and viral diseases. Harmful effects of storage fungi. Effect of growth stage and weather conditions on seed transmission. Paths of infection – ovule, embryo, endosperm, seed-coat and pericarp infection, seed contamination. Seed health testing methods. Management of seed-borne diseases- physical, cultural, chemical and biological methods. Quarantine laws and procedures for seed certification. Pest risk analysis.

Practical:

Inspection of dry seeds. Detection of seed-borne pathogens by seed washing test. Detection of seed-borne pathogens by blotter method.. Detection of seed-borne pathogens by agar plate method. Seedling symptom tests. Embryo count method. Molecular techniques for detection of seed borne pathogens (ELISA and PCR). Identification of common seed-borne fungi Alternaria, Colletotrichum, Drechslera, Fusarium etc under microscope. Effect of chemical and biological seed treatment on seed-borne pathogens. Inspections of seed crops in field.

Suggested Readings:

1. Agarwal V.K and J.B. Sinclair. 1993. Principles of Seed Pathology, Vol I& II, CRC Press. Inc. Boca Raton, Florida.
2. Hutchins, J.D. and Reeves, J.F. (Eds.). 1997. Seed Testing Progress towards the 21st Century. CABI, Wellington.
3. Jha, D.K. 1993. A Text Book on Seed Pathology. Vikash Publishing House Pvt. Ltd., 576, Masjid Road, Jangpura, New Delhi.
4. Jha, D.K. 1995. Laboratory Manual on Seed Pathology. Vikash Publishing House Pvt. Ltd., 576, Masjid Road, Jangpura, New Delhi.
5. Maude, R.B. 1996. Seed-borne Diseases and Their Control. CAB International, U.K.
6. Neergaard, P. 1988. Seed Pathology, Vol. I & II Macmillan Press, U.K.
7. Suryanarayana, D. 1978. Seed Pathology. Vikash Publishing House Pvt. Ltd., 576, Masjid Road, Jangpura, New Delhi.
8. Vishunavat, K. 2007. Seed Health Testing- Principles and Protocols. Kalyani Pubs., 24, Daryanganj, New Delhi.

Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

PBG- 4411

Advanced Seed Technology

3(1+2)

Theory:

Objectives: to make the candidate self reliant in production of hybrid seed and conversant with the seed technology.

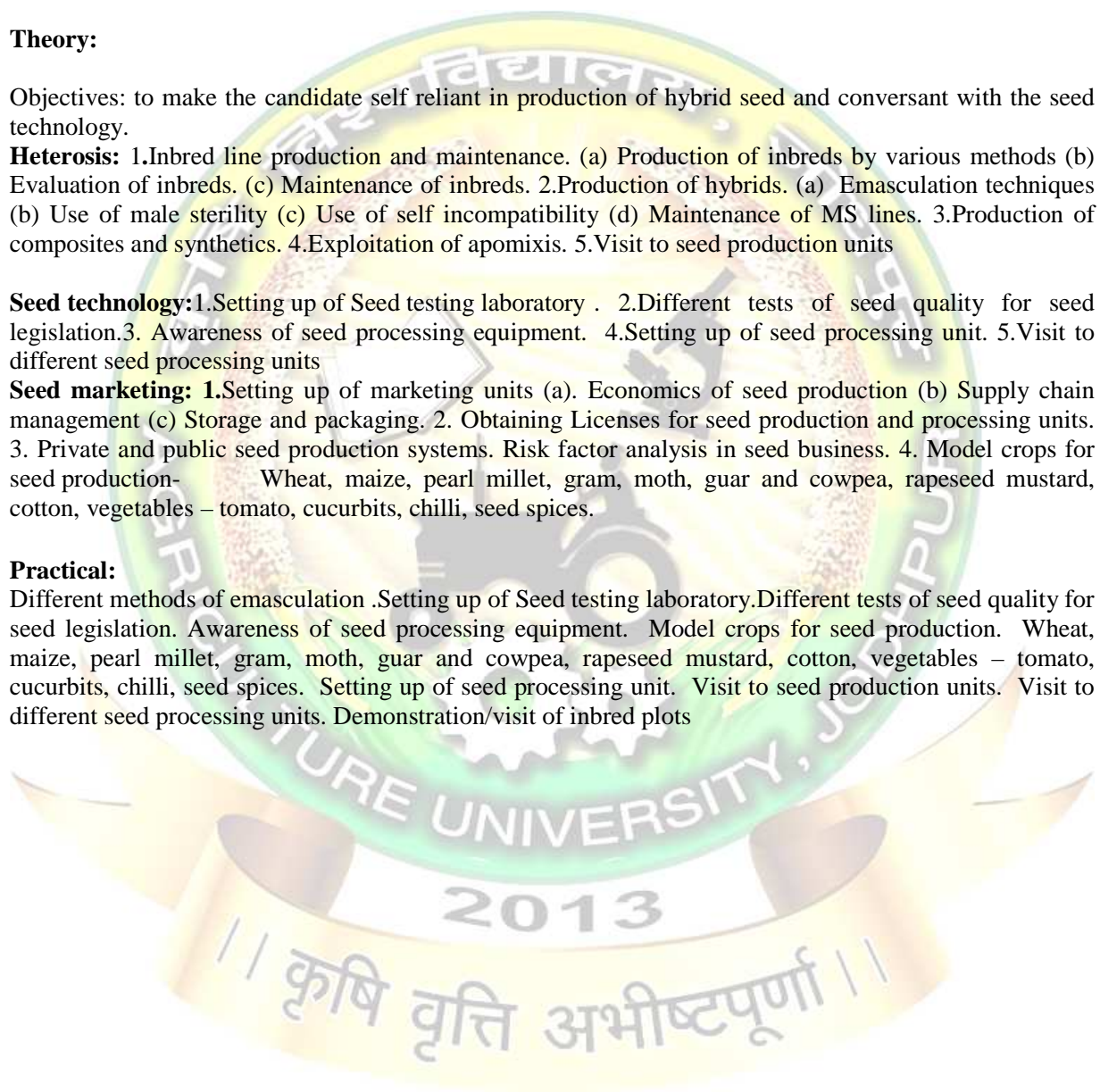
Heterosis: 1. Inbred line production and maintenance. (a) Production of inbreds by various methods (b) Evaluation of inbreds. (c) Maintenance of inbreds. 2. Production of hybrids. (a) Emasculation techniques (b) Use of male sterility (c) Use of self incompatibility (d) Maintenance of MS lines. 3. Production of composites and synthetics. 4. Exploitation of apomixis. 5. Visit to seed production units

Seed technology: 1. Setting up of Seed testing laboratory . 2. Different tests of seed quality for seed legislation. 3. Awareness of seed processing equipment. 4. Setting up of seed processing unit. 5. Visit to different seed processing units

Seed marketing: 1. Setting up of marketing units (a). Economics of seed production (b) Supply chain management (c) Storage and packaging. 2. Obtaining Licenses for seed production and processing units. 3. Private and public seed production systems. Risk factor analysis in seed business. 4. Model crops for seed production- Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices.

Practical:

Different methods of emasculation .Setting up of Seed testing laboratory. Different tests of seed quality for seed legislation. Awareness of seed processing equipment. Model crops for seed production. Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices. Setting up of seed processing unit. Visit to seed production units. Visit to different seed processing units. Demonstration/visit of inbred plots



Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

PBG -4412

Tissue Culture and Micro Propagation Techniques

3(1+2)

Theory:

Setting up of commercial micro propagation unit - Lab and hardening unit design, Equipment, lab wares and consumables, Energy requirement and use of alternate energy sources. Man power requirement, Biosafety measures and waste disposal, Legislative requirement and govt. incentive. Major techniques in micro propagation- Axillary enhancement, Automated somatic embryogenesis systems, Synthetic seeds, Hardening procedures, Sterilization procedure and clean air environment, Risk factor analysis, Handling of contamination, Packaging and transportation, Marketing and Supply chain management, Economics of micro propagation, Material procurement, Stores handling, Cost reduction during production and hardening. GMP and HACCP requirement. Visit to commercial production units and case studies.

Practical:

Lab and hardening unit design. . Familiarity with equipments, lab wares and consumables. Procedures of autoclaving, Media preparation Explant preparation, Surface sterilization, Axillary bud, nodal explant culture, experiments to induce somatic embryos. Preparation of synthetic seeds, Experiments for hardening of in vitro explants. Visit to commercial Production units and case studies.

Suggested Readings:

1. Chawala H S (2000) Introduction to Plant Biotechnology. Oxford & IBH
2. Gupta, P. K. (2008) Elements of biotechnology Rastogi publications Meerut
3. Ray V. Herren (2005) Introduction to biotechnology (An Agricultural revolution)
4. Shekhawat, MS (2011) Plant Biotechnology, In vitro principles, Techniques and Applications, MJP Publishers, Chennai
5. Mascarenhas, A. F. (2008) Hand book of Plant tissue Culture, ICAR. New Delhi.

Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

SCHEM- 4411

Vermicompost and Organic Farming

3 (1+2)

Theory:

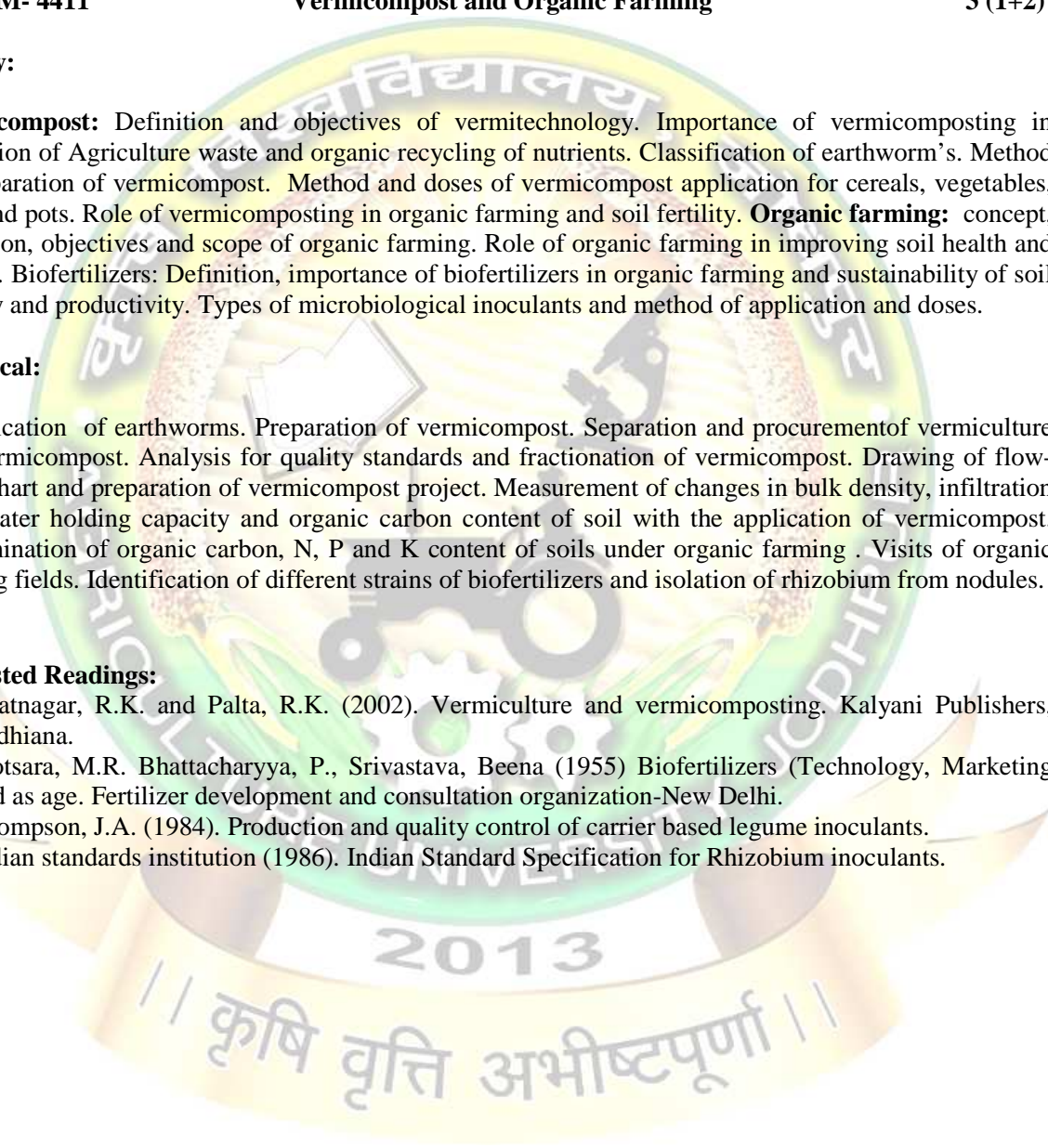
Vermicompost: Definition and objectives of vermiculture. Importance of vermicomposting in utilization of Agriculture waste and organic recycling of nutrients. Classification of earthworm's. Method of preparation of vermicompost. Method and doses of vermicompost application for cereals, vegetables, trees and pots. Role of vermicomposting in organic farming and soil fertility. **Organic farming:** concept, definition, objectives and scope of organic farming. Role of organic farming in improving soil health and quality. Biofertilizers: Definition, importance of biofertilizers in organic farming and sustainability of soil fertility and productivity. Types of microbiological inoculants and method of application and doses.

Practical:

Identification of earthworms. Preparation of vermicompost. Separation and procurement of vermiculture and vermicompost. Analysis for quality standards and fractionation of vermicompost. Drawing of flow-sheet chart and preparation of vermicompost project. Measurement of changes in bulk density, infiltration rate, water holding capacity and organic carbon content of soil with the application of vermicompost. Determination of organic carbon, N, P and K content of soils under organic farming. Visits of organic farming fields. Identification of different strains of biofertilizers and isolation of rhizobium from nodules.

Suggested Readings:

1. Bhatnagar, R.K. and Palta, R.K. (2002). Vermiculture and vermicomposting. Kalyani Publishers, Ludhiana.
2. Motsara, M.R. Bhattacharyya, P., Srivastava, Beena (1955) Biofertilizers (Technology, Marketing and as age. Fertilizer development and consultation organization-New Delhi.
3. Thompson, J.A. (1984). Production and quality control of carrier based legume inoculants.
4. Indian standards institution (1986). Indian Standard Specification for Rhizobium inoculants.



Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

SCHEM – 4412

Soil Plant and Water Analysis

3 (1+2)

Theory:

Principle of pH meter, EC meter, spectrophotometer, flame photometer and A A S Soil analysis: Objectives, Sampling of soil, procedure and precautions. Interpretation of analytical data and nutrient index Plant analysis: Sampling, stages and plant part to be sampled .Total plant analysis, Quantitative rating of plant analysis data and interpretation of results, critical nutrient concentration (CNC), critical nutrient range (CNR). Nutrient use efficiency. Rapid plant tissue test for N, P, K and their interpretation for fertilizer recommendation,. Visual diagnostic criteria for the nutrient deficiency and toxicity of plants. Errors in soil and plant analysis. Classification and minimization of errors. Water analysis: Quality criteria, classification and suitability of irrigation water and water quality index

Practical:

Standardization of solutions and reagents, collection and preparation of soil samples, estimation of pH, EC, organic carbon, NPKS, micronutrients, CEC and exchangeable sodium in soil. Determination of EC and pH of saturation extract / paste. Estimation of cations(Ca^{++} , Mg^{++} and Na^{+}) and anions (CO_3^{-} and HCO_3^{-}) in saturation extract . Plant sampling and sample preparation for analysis, digestion of plant material and estimation of N, P, K in plant. Rapid plant tissue test for N, P and K Determination of EC, pH, cations (Ca^{++} + Mg^{++} , Na^{+} , K^{+}) and anions (CO_3^{-} , HCO_3^{-} , Cl^{-}) in irrigation water and.Computation of S A R and R S C .

Suggested Readings:

1. S.L. Chopra and J.S. Kanwar, 1999. Analytical Agriculture Chemistry, Kalyani Publisher, Lucknow.
2. T.D. Biswas and S.K. Mukherjee 1995. Text book of Soil Science (2nd Ed.) Tata Graw Hill Publishing Company Limited, New Delhi.
3. M.L. Jackson 1973. Soil Chemical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi.
4. H.L.S. Tandon 1990. Methods of Analysis of soil, plant, water and fertilizers, FDCO, New Delhi.
5. Tisdale, W.L. Nelson and J.D. Beaton, 1990. Soil Fertility and Fertilizers Macmillan Publishing Company, New York
6. P. K. Gupta 1999-2000. Soil, Plant, Water and Fertilizer Analysis, AgroBotanica, Bikaner.
7. Richards, L.A. (1954). Diagnosis and improvement of saline and alkali soils. USDA Hand book No. 60, Washington, DC USA.

Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

S.CHEM- 4413

Soil Management

3 (1+2)

Theory:

Soil resources of India; distribution of wasteland and problematic soils with special reference to Rajasthan; soil tillage management; soil crusting and its management; management of soil moisture under different climates; effect of water quality on soils and plants; soil aeration problems and management; soil thermal regimes in relation to crops and their optimization.

Recycling of agricultural and industrial wastes, waste land and their management; reclamation and management of acidic, saline and sodic soils, constraints and management of highly and slowly permeable soils; soil erosion, extent, type and effects, soil conservation technique, water harvesting techniques and watershed management, remote sensing for soil and watershed management.

Practical:

Determination of saturated hydraulic conductivity, bulk density measurement of soil measurement of water holding and field capacities of soil, measurement of infiltration rate and moisture retention characteristics curve in normal, problematic and reclaimed soils. Preparation of saturation paste and saturation extracts of salt affected soils. Determination of pH, EC, cations and anions in saturation extract. Determination of CaCO₃ equivalent of liming material. Estimation of lime requirement of acid soils and gypsum requirement of sodic soils. Measurement of ODR of soil. Estimation of water stable aggregate in soil and field trip to study the areas of problematic soils.

Suggested Readings:

1. Abrol, I.P. and Dhurva narayana, V.V. (1998) Technologies for wasteland development, ICAR, New Delhi-110012
2. Agarwal, R.R., Yadav, J.S.P. and Gupta, R.N. (1982). Saline Alkali soils of India, ICAR, New Delhi.
3. Biswas, T.D. Naryanswami, G, Goswami, N.R; Sekhon, G.S. and Shastri, T.G. (1991). Soil related constraints in crop production. Tech. Bull. No. 15. Indian Society of Soil Science, New Delhi.
4. Biswas, T.D. and Mukharjee, S.K. (1990). Text book of soil science, Tata Mc Graw till publishing co. Ltd. New Delhi.
5. Cirsan Paul, J.(1985) Principles of remote sensing. Longman, New York.
6. Lal, P.; Chhipa, B.R. and Purohit, A.K. (1994). Salt affected soils- A modern synthesis Agro, Botanical publisher, Bikaner
7. Richards, L.A. (1954). Diagnosis and improvement of saline and alkali soils. USDA Hand book No. 60, Washington, DC USA.
8. Somani, L.L. and Totawat, K.L. (1993). Management of salt affected soils and waters. Agrotech publishing Academy, Udaipur

Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

STAT-4411

Sampling Techniques

3(1+2)

Theory:

Sampling unit. Sampling frame, Principles of sample survey. main steps in survey, types of sampling, advantages of sampling over census, limitations of sampling; Sources and types of non-sampling errors, biases and variance error, non-sampling bias, non-coverage, incomplete frames and missing units; Simple random sampling with NN without replacement. Stratified sampling. Systematic sampling; Cluster sampling, multi-stage sampling. Basic idea about ratio and regression estimators. NOTE : Mathematical derivations and proofs are excluded.

Practicals:

Random sampling - use of random number tables. Determination of sample size, estimation of mean and variance of simple random sampling with and without replacement, stratified random sampling, cluster sampling, two ,tape sampling, Ratio and Regression estimators, Efficiency of SRSWR over SRSWOI?., Estimation of gain in precision due to stratification. Relative efficiency of cluster sampling equal cluster over unequal cluster.

Suggested Readings:

1. Cochran, W.G. 1977. Sampling Techniques, John Wiley.
2. Murthv, M.N. 1977. Sampling Theory and Methods. 2nd Ed, statistical Publ.
3. Singh, D. Singh, P. and Kumar, P. 1982. Handbook on Sampling Methods, IASRI Publ
4. Sukhatme. I.V.; Sul:hatme. I3.V.; Sulalatme, S. and Ashok. C. 1984. Sampling Theory of Surveys with Applications. Iowa State university Press and Indian Society of Agricultural Statistics. New Delhi.



Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

AP- 4411

Dairy Cattle Production

3(1+2)

Theory:

Importance of dairying. Important milch breeds of cattle and buffalo. Selection, purchase and insurance of dairy animals. Scientific management of calves, heifers, bull calves, dry, pregnant and lactating dairy animals. Least cost ration formulation. Systems of breeding. Factors affecting productive and reproductive efficiency of dairy animals.

Practical:

Selection of site for dairy farm. Layout of dairy farm building. Computation and formulation of milk replacer, calf starter, concentrate mixture for lactating, pregnant and dry animals. Computation of balance ration for various categories of dairy animals. Physical and chemical treatment of low quality roughages. Plan for supplying green fodder throughout the year. Vaccination in various categories of dairy animals. Dehorning in dairy calves. Castration of male calves. Control of ecto and endo parasites. Colostrum and its utility. Weaning and rearing of dairy calves. Determination of age of animal. Care and management of dairy calves. Management of lactating, dry and pregnant cows. Dairy hygiene. Clean milk production and its marketing. Cleaning and sanitization of dairy equipments. Milking machine and its operation. Management of milch animals during adverse climatic conditions. Symptoms of estrus in dairy animals. Pregnancy diagnosis. Artificial insemination and its importance. Hay and silage making. Temperature, pulse and respiration rate in dairy animals.

Suggested Readings:

1. Banerjee, G. C. A Text Book of Animal Husbandry
2. A Text Book of Livestock Production Management in Tropic by D N Verma
3. Dairy Bovine Production by C K Thomus and NSR Sastry
4. Hand Book of Animal Husbandry published by DIPA, ICAR, KAB, New Delhi-12

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Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

AP-4412 POULTRY PRODUCTION AND MANAGEMENT 3(1+2)

Theory: Poultry breeds of economic importance. Formation and laying of egg. Systems of poultry rearing. Feeding and management of different categories of poultry. Common nutritional disorders of birds. Vaccination and deworming. Selection and culling of different classes of poultry. Formulation of poultry farm plan.

Practical: Familiarity with external body parts of chicken. Handling and restraining of poultry birds. Selection of site for poultry farm. Layout of poultry farm buildings. Brooding, debeaking and vaccination of chicks. Internal structure and composition of egg. Collection, recording, grading, marketing and preservation of chicken eggs. Management of broilers. Dressing of birds. Incubation of eggs. Common feed ingredients. Feed additives used in poultry. Formulation of chick starter, grower and layer feed. Formulation of broiler starter and finisher feed. Cleaning and disinfection of poultry houses. Management of poultry farm under adverse climatic conditions. Economics of poultry farm.

Suggested Readings:

1. A Text Book of Animal Husbandry by G C Banerjee
2. A Text Book of Livestock Production Management in Tropic by D N Verma
3. Poultry Production by R A Singh
4. Hand Book of Animal Husbandry published by DIPA, ICAR, KAB, New Delhi-12
5. Feeding of Poultry by Panda et al published by DIPA, ICAR, KAB, New Delhi-12



Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

NEMAT-4411

Economic Nematology

3 (1+2)

Objectives - To impart the basic and practical knowledge related with economic importance of Nematodes in field and horticultural crops.

Theory:

Historical perspectives, Economic importance and symptoms of nematode diseases in plants, Nematode diseases of field crops: Cereals- Ear cockle and yellow ear rot diseases of wheat, Molya disease of Wheat and Barley, Maize cyst nematode disease; Nematode diseases of vegetables (Root-knot, Reniform diseases of tomato, brinjal, Potato, Cauliflower, Chillies, peas, okra, cucurbits, fruits (Root-knot nematode, citrus . Nematode and reniform nematodes of Papaya, Banana and Citrus etc); Phytonematode management in field / horticultural crops-including conomic management strategies viz .cultural, physical, chemical, biological, breeding for disease management and Integrated nematode management etc.

Practical:

Diagnosis of economic important diseases in the state;Survey and surveillance and collection of soil and plant samples from nematode infested fields of various crops;Extraction of nematodes from soil and plant samples;Preparations of semipermanent mount of nematodes from nematode suspension;Identification of various stages of semi-endo and endo parasitic nematodes of economic importance;Study of pathogenic level of phytonematodes in crops;Study of apparatus/equipments used during the chemical control strategy ; Calculation of recommended doses of nematicides /bio- agents.

Suggested Readings:

1. D.S.Bhatti and R.K.Walia.1992.Nematode pests of crops.C.B.S.Publication, N.Delhi.
2. S.I.Hussain and T.A.Khan.1988.Nematode diseases of plants. Cosmo Publ. N.Delhi.
3. G.Swarup and D.R.Dasgupta,1986.Plant Parasitic Nematodes of India: Problem and Progress, IARI, New Delhi-110012.
4. G. L. Sharma. 2009. Phtonematode Management in Field Crops Oxford Book Co. Jaipur.
5. P.Parvathareddy. 1987. A treaties on Phytonematology. Agricole Publishing Academy, New

Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

PPHYS- 4411

Plant Growth Regulators in Agriculture

3 (1+2)

Theory:

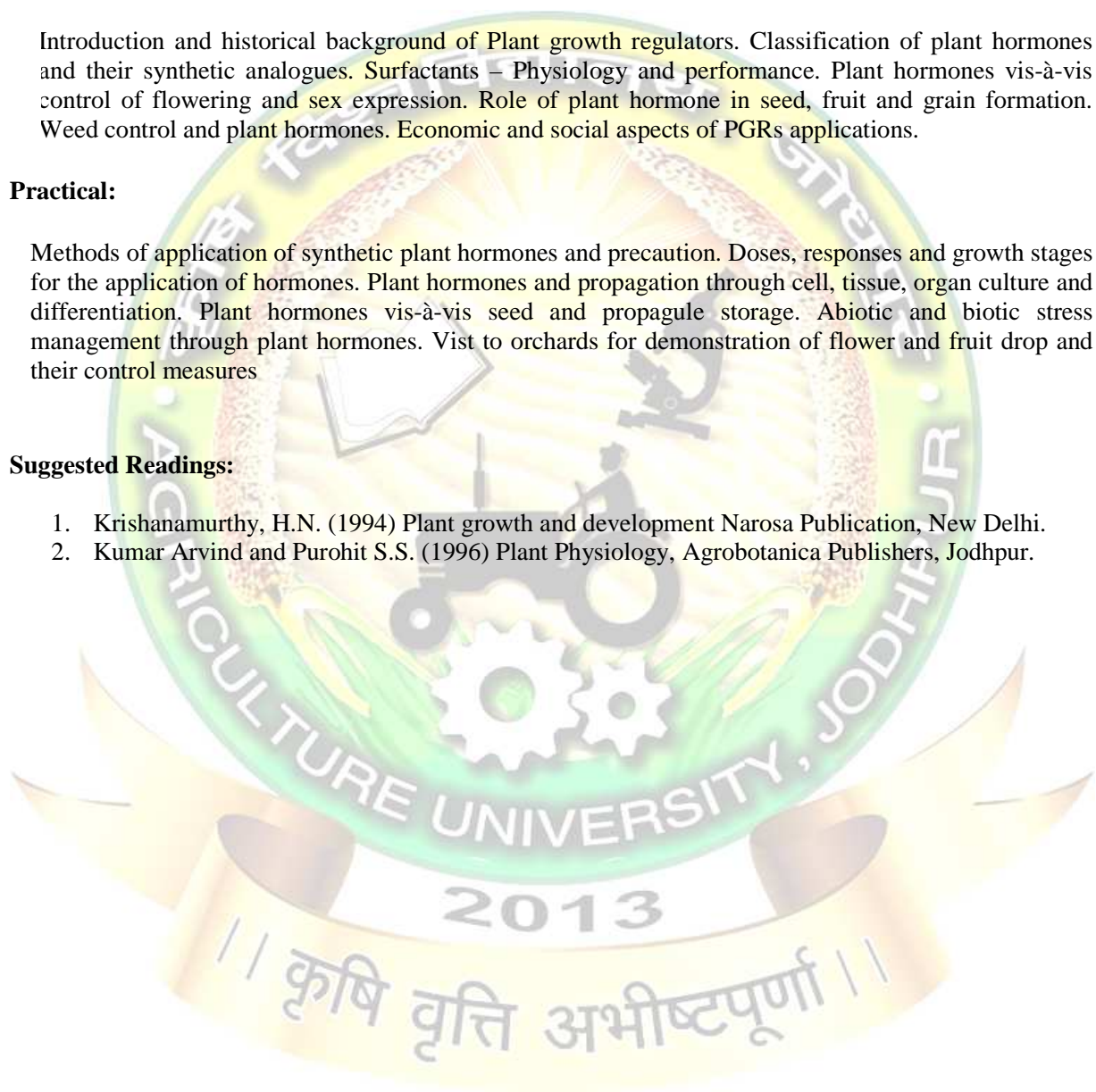
Introduction and historical background of Plant growth regulators. Classification of plant hormones and their synthetic analogues. Surfactants – Physiology and performance. Plant hormones vis-à-vis control of flowering and sex expression. Role of plant hormone in seed, fruit and grain formation. Weed control and plant hormones. Economic and social aspects of PGRs applications.

Practical:

Methods of application of synthetic plant hormones and precaution. Doses, responses and growth stages for the application of hormones. Plant hormones and propagation through cell, tissue, organ culture and differentiation. Plant hormones vis-à-vis seed and propagule storage. Abiotic and biotic stress management through plant hormones. Vist to orchards for demonstration of flower and fruit drop and their control measures

Suggested Readings:

1. Krishnamurthy, H.N. (1994) Plant growth and development Narosa Publication, New Delhi.
2. Kumar Arvind and Purohit S.S. (1996) Plant Physiology, Agrobotanica Publishers, Jodhpur.



Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

AECON-4413

Natural Resource Economics and Management

3 (2+1)

Theory:

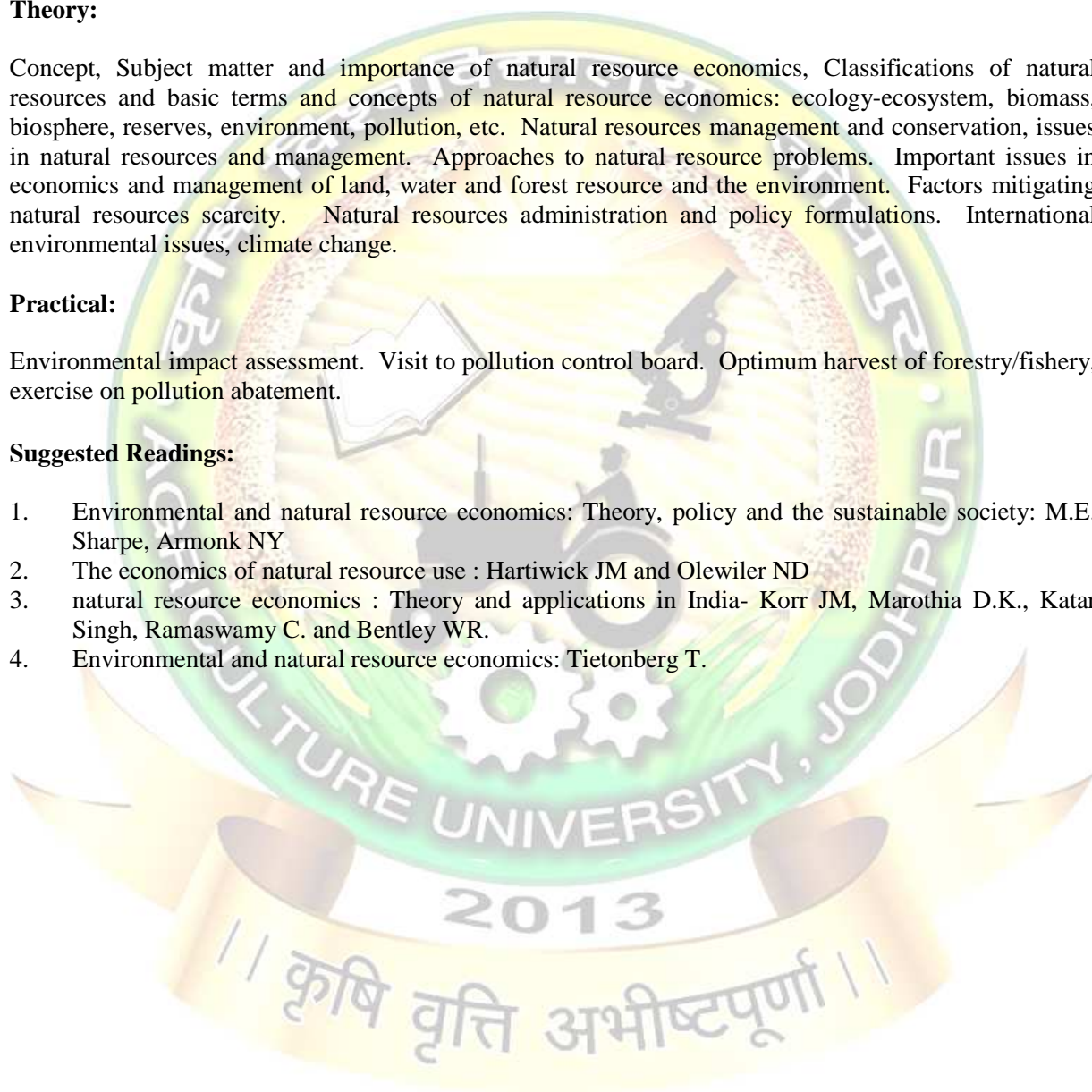
Concept, Subject matter and importance of natural resource economics, Classifications of natural resources and basic terms and concepts of natural resource economics: ecology-ecosystem, biomass, biosphere, reserves, environment, pollution, etc. Natural resources management and conservation, issues in natural resources and management. Approaches to natural resource problems. Important issues in economics and management of land, water and forest resource and the environment. Factors mitigating natural resources scarcity. Natural resources administration and policy formulations. International environmental issues, climate change.

Practical:

Environmental impact assessment. Visit to pollution control board. Optimum harvest of forestry/fishery, exercise on pollution abatement.

Suggested Readings:

1. Environmental and natural resource economics: Theory, policy and the sustainable society: M.E. Sharpe, Armonk NY
2. The economics of natural resource use : Hartwick JM and Olewiler ND
3. natural resource economics : Theory and applications in India- Korr JM, Marothia D.K., Katar Singh, Ramaswamy C. and Bentley WR.
4. Environmental and natural resource economics: Tietonberg T.



Syllabus
B. Sc. (Ag) Hons. Part-IV, Semester-I
Agriculture University, Jodhpur

AECON-4411

Marketing Management

3(2+1)

Theory:

Marketing Management: Meaning, definitions, marketing, Mix, market segmentation, targeting & positioning, market information system, market organization and control. 4P's of marketing, product life cycle. Marketing potential: Classification of products, new product development, product line, product mix, branding, packaging and labeling. Factors affecting on prices: Pricing policies, strategies and pricing methods. Types of distribution channels. Functions of channels, members and channel management decisions.

Practical:

Performance analysis of regulated market and Marketing societies. Price spread and Marketing efficiency analysis.

Suggested Readings:

1. Marketing Management: V.S. Ramaswamy, S. Namakumari-Macmillian publishers India Ltd.
2. Marketing Management: Kotler P. 2002 Analysis planning, implementation and control, Pearson Edu.
3. Marketing Management : Saxena, M.C. GrawHill
4. Fundamentals of Marketing : Stanton W.J. Etzal MJ & Walker B.J. Mc GrawHill



Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-I

Agriculture University, Jodhpur

AECON-4412

Project Formulation, Evaluation and Monitoring

3(1+2)

Theory:

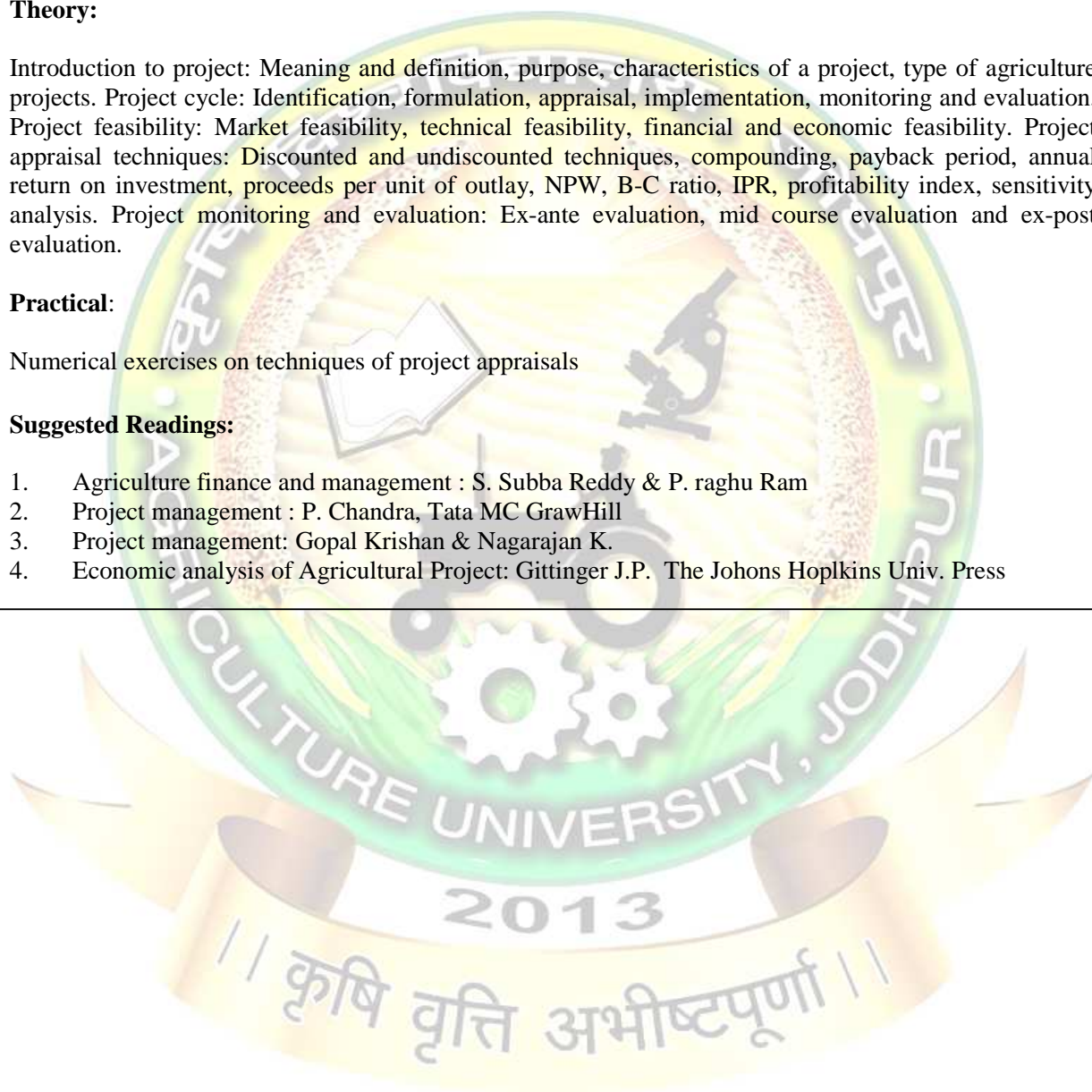
Introduction to project: Meaning and definition, purpose, characteristics of a project, type of agriculture projects. Project cycle: Identification, formulation, appraisal, implementation, monitoring and evaluation. Project feasibility: Market feasibility, technical feasibility, financial and economic feasibility. Project appraisal techniques: Discounted and undiscounted techniques, compounding, payback period, annual return on investment, proceeds per unit of outlay, NPW, B-C ratio, IPR, profitability index, sensitivity analysis. Project monitoring and evaluation: Ex-ante evaluation, mid course evaluation and ex-post evaluation.

Practical:

Numerical exercises on techniques of project appraisals

Suggested Readings:

1. Agriculture finance and management : S. Subba Reddy & P. raghu Ram
 2. Project management : P. Chandra, Tata MC GrawHill
 3. Project management: Gopal Krishan & Nagarajan K.
 4. Economic analysis of Agricultural Project: Gittinger J.P. The Johns Hopkins Univ. Press
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Syllabus

B. Sc. (Ag) Hons. Part-IV, Semester-II **Agriculture University, Jodhpur**

Rural Agricultural Work Experience (RAWE)

Programme	Duration (Weeks) & Credits
Orientation	1 (Non Credit)
Research Station/KVK/ including village attachment and <i>In-situ</i> interaction of farmers, students and research station scientists	6 (6 credits)
<i>In-situ</i> interaction of farmers, college faculty and students	2 (in two splits)(2 credits)
Industrial Attachment*/Skill Development/Experiential Learning Courses	8 (8 credits)
Educational Tour	2 (2 credits)
Project Report Preparation and Evaluation	1 (Non Credit)
Total	18(0+18)

*Industrial attachment shall include attachment with any of the following industries/organizations

1. Seed industries/companies
2. Fertilizer industries/companies
3. Pesticide industries/companies
4. Biotechnological industries/companies
5. Tissue culture laboratories
6. Bio-pesticide industries
7. Commercial nurseries/landscaping units
8. Food processing units
9. Agricultural finance institutions/banks/credit societies etc.
10. Non-Governmental Organizations

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