

DAV UNIVERSITY JALANDHAR



FACULTY OF AGRICULTURAL SCIENCES

COURSE CURRICULUM

FOR

M.Sc. Ag. Hort. (Vegetable Science)

1st to 4th SEMESTER

Examinations 2020–2021 session onwards

Applicable for admissions in 2020

M.Sc. Ag. Hort. Vegetable Science

Semester I

S. No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	AGS551	Production Technology of cool season vegetable crops	Core	2	0	2	3
2	AGS552	Breeding of vegetable crops	Core	2	0	2	3
3	AGS553	Growth and development of vegetable crops	Core	2	0	2	3
4	AGS554	Post harvest management of vegetable crops	Core	2	0	2	3
5	Open elective or Interdisciplinary elective-I			2	0	2	3
6	CSA559	Computer Fundamentals and Programming	Compulsory Foundation	2	0	2	3

Total=3+3+3+3+3+3=18

L=Lecture; T= tutorial; P=Practical; Cr=Credit

SemesterII

S. No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	AGS555	Production Technology of summer season vegetable crops	Core	2	0	2	3
2	AGS556	Seed production technology of vegetable crops	Core	2	0	2	3
4	Departmental elective- II			1	0	2	2
5	Open elective or Interdisciplinary elective-I			2	0	2	3
6	ENG 551	Technical writing and communications skills	compulsory foundation	0	1	2	1
7	AGS503	Intellectual property and its management in agriculture	compulsory foundation	0	1	2	1
8	AGS500	Research	Core	0	4	8	4

Total=3+3+2+3+4=17

L=Lecture; T= tutorial; P=Practical; Cr=Credit

Semester II**Departmental elective II**

S. No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	AGS557	Fundamentals of processing of vegetables	1+1	1	0	2	2
2	AGS558	Systematics of vegetable crops	1+1	1	0	2	2
3	AGS559	Production technology of underexploited vegetable crops	1+1	1	0	2	2

L=Lecture; T= tutorial; P=Practical; Cr=Credit

Semester III

S. No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	AGS560	Master's Seminar	Core	0	1	2	1
2	MTH 670	Statistical method for applied sciences	Compulsory Foundation	3	0	2	4
3	AGS504	Basic Concepts In Laboratory Techniques	Compulsory Foundation	0	1	2	1
4	AGS505	Agricultural Research, Research Ethics And Rural Development Programmes	Compulsory Foundation	1	0	0	1
5	LIB101	Library And Information Services	Compulsory Foundation	0	1	2	1
6	EVS658	Disaster Management	Compulsory Foundation	1	0	0	1
7	AGS500	Research	Core	0	6	12	6

Total=1+4+1+1+1+1+6=15

L=Lecture; T= tutorial; P=Practical; Cr=Credit

Semester IV

S. No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	AGS500	Research	Core	0	15	30	15

L=Lecture; T= tutorial; P=Practical; Cr=Credit

Departmental Courses

S.No.	Paper code	Title	Type	Credit
1	AGS551	Production Technology of cool season vegetable crops	Core	2+1
2	AGS552	Breeding of vegetable crops	Core	2+1
3	AGS553	Growth and development of vegetable crops	Core	2+1
4	AGS554	Post harvest management of vegetable crops	Core	2+1
5	AGS555	Production Technology of summer season vegetable crops	Core	2+1
6	AGS556	Seed production technology of vegetable Crops	Core	2+1
7	AGS557	Fundamentals of processing of vegetables	Elective	1+1
8	AGS558	Systematic of vegetable crops	Elective	1+1
9	AGS559	Production technology of underexploited vegetable crops	Elective	1+0
10	AGS560	Seminar	Core	0+1

Syllabus

AGS 551 PRODUCTION TECHNOLOGY OF COOL SEASON VEGETABLE CROPS

2+1

Theory: Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures and seed production of:

UNIT I

Potato, Bulb crops: onion and garlic

UNIT II

Cole crops: cabbage, cauliflower, knoll kohl, sprouting broccoli, Brussels sprout

UNIT III

Root crops: carrot, radish, turnip and beetroot

UNIT IV

Peas and broad bean, green leafy cool season vegetables

Practical

Cultural operations (fertilizer application, sowing, mulching, irrigation, weed control) of winter vegetable crops and their economics; Experiments to demonstrate the role of mineral elements, plant growth substances and herbicides; study of physiological disorders; preparation of cropping scheme for commercial farms; visit to commercial greenhouse/ polyhouse

Suggested Readings

Bose TK & Som MG. (Eds.). 1986. Vegetable Crops in India.

Naya Prokash. Bose TK, Som G & Kabir J. (Eds.). 2002. Vegetable Crops. Naya Prokash.

Bose TK, Som MG & Kabir J. (Eds.). 1993. Vegetable Crops. Naya Prokash.

Bose TK, Kabir J, Maity TK, Parthasarathy VA & Som MG. 2003. Vegetable Crops. Vols. I-III.

Naya Udyog. Chadha KL & Kalloo G. (Eds.). 1993-94. Advances in Horticulture Vols. V-X.

Malhotra Publ. House. Chadha KL. (Ed.). 2002. Hand Book of Horticulture. ICAR.

Chauhan DVS. (Ed.). 1986. Vegetable Production in India. Ram Prasad & Sons.

AGS552: BREEDING OF VEGETABLE CROPS 2+1

Origin, botany, taxonomy, cytogenetics, genetics, breeding objectives, breeding methods (introduction, selection, hybridization, mutation), varieties and varietal characterization, resistance breeding for biotic and abiotic stress, quality improvement, molecular marker, genomics, marker assisted breeding and QTLs, biotechnology and their use in breeding in vegetable crops-Issue of patenting, PPVFR act for:

UNIT I

Potato, tomato, sweet potato and tapioca ,carrot, beetroot, radish,

UNIT II

Eggplant, hot pepper, sweet pepper and okra

UNIT III

Peas and beans, amaranth, chenopods and lettuce

UNIT IV

Gourds, melons, pumpkins and squashes, Cabbage, cauliflower

Practical

Selection of desirable plants from breeding population observations and analysis of various qualitative and quantitative traits in germplasm, hybrids and segregating generations; induction of flowering, paleontological studies, selfing and crossing techniques in vegetable crops; hybrid seed production of vegetable crops in bulk. screening techniques for insect-pests, disease and environmental stress resistance in above mentioned crops, demonstration of sib-mating and mixed population; molecular marker techniques to identify useful traits in the vegetable crops and special breeding techniques. Visit to breeding blocks.

Suggested Readings

Allard RW. 1999. *Principles of Plant Breeding*. John Wiley & Sons.

Basset MJ. (Ed.). 1986. *Breeding Vegetable Crops*. AVI Publ.

Dhillon BS, Tyagi RK, Saxena S. & Randhawa GJ. 2005. *Plant Genetic Resources: Horticultural Crops*. Narosa Publ. House.

Fageria MS, Arya PS & Choudhary AK. 2000. *Vegetable Crops: Breeding and Seed Production*. Vol. I. Kalyani.

AGS553 GROWTH AND DEVELOPMENT OF VEGETABLE CROPS 2+1

UNIT I

Cellular structures and their functions; definition of growth and development, growth analysis and its importance in vegetable production.

UNIT II

Physiology of dormancy and germination of vegetable seeds, tubers and bulbs; Role of auxins, gibberellins, cytokinins and abscisic acid; Application of synthetic hormones, plant growth retardants and inhibitors for various purposes in vegetable crops.

UNIT III

Role and mode of action of morphactins, antitranspirants, anti-auxin, ripening retardant and plantstimulants in vegetable crop production. Role of light, temperature and photoperiod on growth, development of underground parts, flowering and sex expression in vegetable crops; apical dominance. Physiology of fruit set, fruit development, fruit growth, flower and fruit drop.

UNIT IV

Parthenocarpy in vegetable crops; phototropism, ethylene inhibitors, senescence and abscission; fruit ripening and physiological changes associated with ripening. Plant growth regulators in relation to vegetable production; morphogenesis and tissue culture techniques in vegetable crops.

Practical

Preparation of solutions of plant growth substances and their application; experiments in breaking and induction of dormancy by chemicals; induction of parthenocarpy and fruit ripening; application of plant growth substances for improving flower initiation, changing sex expression in cucurbits and checking flower and fruit drops and improving fruit set in solanaceous vegetables; growth analysis techniques in vegetable crops.

Suggested Readings

Bleasdale JKA. 1984. *Plant Physiology in Relation to Horticulture*. 2nd Ed. MacMillan.

Gupta US. (Ed.). 1978. *Crop Physiology*. Oxford & IBH.

Krishnamoorti HN. 1981. *Application Plant Growth Substances and Their Uses in Agriculture*. Tata-McGraw Hill

AGS554 Post harvest management of vegetable crops 2+1

UNIT I

History of food preservation. Present status and future prospects of vegetable preservation industry in India.

UNIT II

Spoilage of fresh and processed horticultural produce; biochemical changes and enzymes associated with spoilage of horticultural produce; principal spoilage organisms, food poisoning and their control measures. Role of microorganisms in food preservation.

UNIT III

Raw materials for processing. Primary and minimal processing; processing equipments; Layout and establishment of processing industry, FPO licence. Importance of hygiene; Plant sanitation. Quality assurance and quality control, TQM, GMP. Food standards – FPO,PFA, etc. Food laws and regulations.

UNIT IV

Food safety – Hazard analysis and critical control points (HACCP). Labeling and labeling act, nutrition labeling. Major value added products from vegetables.Utilization of byproducts of vegetable processing industry; Management of waste from processing factory. Investment analysis. Principles and methods of sensory evaluation of fresh and processed vegetables.

Practical

Study of machinery and equipments used in processing of horticultural produce; Chemical analysis for nutritive value of fresh and processed vegetables; Study of different types of spoilages in fresh as well as processed horticultural produce; Classification and identification of spoilage organisms; Study of biochemical changes and enzymes associated with spoilage; Laboratory examination of vegetable products; Sensory evaluation of fresh and processed vegetables; Study of food standards – National, international, CODEX Alimentarius; Visit to processing Sections to study the layout, equipments, hygiene, sanitation and residual / waste management.

Suggested Readings

Arthey D & Dennis C. 1996. *Vegetable Processing*. Blackie/Springer- Verlag.

Chadha DS. 2006. *The Prevention of Food Adulteration Act*. Confed. of Indian Industry.

Desrosier NW. 1977. *Elements and Technology*. AVI Publ. Co.

AGS 555 Production Technology of summer season vegetable crops 2+1

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post harvest management, plant protection measures, economics of crop production and seed production of:

UNIT I

Tomato, eggplant, hot and sweet peppers

UNIT II

Okra, beans, cowpea and clusterbean

UNIT III

Cucurbitaceous crops

UNIT IV

Tapioca and sweet potato, Green leafy warm season vegetables

Practical

Cultural operations (fertilizer application, sowing, mulching, irrigation, weed control) of summer vegetable crops and their economics; study of physiological disorders and deficiency of mineral elements, preparation of cropping schemes for commercial farms; experiments to demonstrate the role of mineral elements, physiological disorders; plant growth substances and herbicides; seed extraction techniques; identification of important pests and diseases and their control; maturity standards; economics of warm season vegetable crops.

Suggested Readings

- Bose TK & Som MG. (Eds.). 1986. *Vegetable Crops in India*. Naya Prokash.
- Bose TK, Kabir J, Maity TK, Parthasarathy VA & Som MG. 2003. *Vegetable Crops*. Vols. I-III. Naya Udyog.
- Bose TK, Som MG & Kabir J. (Eds.). 2002. *Vegetable Crops*. Naya Prokash. Brown HD & Hutchison CS. *Vegetable Science*. JB Lippincott Co.
- Chadha KL & Kalloo G. (Eds.). 1993-94. *Advances in Horticulture*. Vols. V-X. Malhotra Publ. House.
- Chadha KL. (Ed.). 2002. *Hand Book of Horticulture*. ICAR. Chauhan DVS. (Ed.). 1986. *Vegetable Production in India*. Ram Prasad & Sons.
- Decoteau DR. 2000. *Vegetable Crops*. Prentice Hall. Edmond JB, Musser AM & Andrews FS. 1964. *Fundamentals of Horticulture*. Blakiston Co
- Fageria MS, Choudhary BR & Dhaka RS. 2000. *Vegetable Crops: Production Technology*. Vol. II. Kalyani.
- Gopalakrishanan TR. 2007. *Vegetable Crops*. New India Publ. Agency.
- Hazra P & Som MG. (Eds.). 1999. *Technology for Vegetable Production and Improvement*. Naya Prokash.
- Kaloo G & Singh K (Ed.). 2000. *Emerging Scenario in Vegetable Research and Development*. Research Periodicals & Book Publ. House.
- Nayer NM & More TA 1998. *Cucurbits*. Oxford & IBH Publ.
- Palaniswamy & Peter KV. 2007. *Tuber Crops*. New India Publ. Agency.
- Pandey AK & Mudranalay V. (Eds.). *Vegetable Production in India: Important Varieties and Development Techniques*.
- Rana MK. 2008. *Olericulture in India*. Kalyani.
- Rana MK. 2008. *Scientific Cultivation of Vegetables*. Kalyani.
- Rubatzky VE & Yamaguchi M. (Eds.). 1997. *World Vegetables: Principles, Production and Nutritive Values*. Chapman & Hall.
- Saini GS. 2001. *A Text Book of Oleri and Flori Culture*. Aman Publ. House.
- Salunkhe DK & Kadam SS. (Ed.). 1998. *Hand Book of Vegetable Science and Technology: Production, Composition, Storage and Processing*. Marcel Dekker.
- Shanmugavelu KG. 1989. *Production Technology of Vegetable Crops*. Oxford & IBH.

UNIT II

Respiration, ethylene in post-harvest biology, artificial ripening and de-greening of fruits. Physiology of ripening and senescence. Storage system: on-farm storage-evaporatively cooled stores, ventilated storage, pit storage etc. Refrigerated storage refrigeration cycle, controlled/modified atmosphere, hypobaric storage.

UNIT III

Application of growth regulators for quality assurance, post-harvest treatments: pre cooling, heat treatments (hot water, hot air and vapor heat), fungicides & biologically safe chemicals, irradiation, curing, pulsing etc. Packing line operations, packaging of horticultural produce. Transportation- rail, road, sea, air. Codex norms for export of perishables.

UNIT IV

Post harvest diseases of Hort. Products infection process, factors affecting it; modern methods of controlling decay (use of microbial antagonists their mode of action etc.

Practical

Morphological features of some selected fruits and vegetables; maturity indices, harvesting techniques of fruits, field visit & identification of spoilage of fruits and vegetables, on-farm storage/ chilling injury, pre-cooling, CA-treatment post harvest treatments to Hort. produce, pre cooling and storage of fruits and vegetables; studies on pre-treatments of selected fruits; use of chemicals for ripening and enhancing shelf life of fruits and vegetables, various storage systems and structures; pre packaging of fruits; GC for ethylene estimation. Pre packaging of vegetables; physiological disorders-chillign injury of banana and custard apple, Electrolyte leakage/membrane permeability/ RWC HPLC analysis.

Suggested Readings

Kadar, A.A. 1992. *Post-harvest Technology of Horticultural Crops*. 2nd Ed. University of California.

Salunkhe, D.K., Bolia, H.R. and Reddy, N.R. 1991. *Storage, Processing and Nutritional Quality of Fruits and Vegetables*. Vol. I. Fruits and Vegetables. CRC.

Verma, L.R. and Joshi, V.K. 2000. *Post Harvest Technology of Fruits and Vegetables*. Indus Publ.

Thompson, A.K. 1995. *Post harvest technology of fruits and vegetables*. Blackwell Sciences.

Peter, K.V. 2003. *Plantation Crops*. NBT, New Delhi.

AGS558 Systematics of vegetable crops

1+1

UNIT I

Principles of classification; different methods of classification; salient features of international code of nomenclature of vegetable crops.

UNIT II

Origin, history, evolution and distribution of vegetable crops, botanical description of families, genera and species covering various tropical, subtropical and temperate vegetables.

UNIT III

Cytological level of various vegetable crops; descriptive keys for important vegetables.

UNIT IV

Importance of molecular markers in evolution of vegetable crops; molecular markers as an aid in characterization and taxonomy of vegetable crops.

Practical

Identification, description, classification and maintenance of vegetable species and varieties; survey, collection of allied species and genera locally available; preparation of keys to the species and varieties; methods of preparation of herbarium and specimens.

Suggested Readings

Chopra GL. 1968. *Angiosperms - Systematics and Life Cycle*. S. Nagin Dutta AC. 1986. *A Class Book of Botany*. Oxford Univ. Press.

Pandey BP. 1999. *Taxonomy of Angiosperm*. S. Chand & Co.

Peter KV & Pradeepkumar T. 2008. *Genetics and Breeding of Vegetables*. (Revised), ICAR.

Soule J. 1985. *Glossary for Horticultural Crops*. John Wiley & Sons.

Srivastava U, Mahajan RK, Gangopadyay KK, Singh M & Dhillon BS. 2001. *Minimal Descriptors of Agri-Horticultural Crops*. Part-II: *Vegetable Crops*. NBPGR, New Delhi.

Vasistha. 1998. *Taxonomy of Angiosperm*. Kalyani.

Vincent ER & Yamaguchi M. 1997. *World Vegetables*. 2nd Ed. Chapman & Hall.

AGS 559 Production technology of underexploited vegetable crops 2+1

UNIT I

Asparagus, artichoke and leek

UNIT II

Brussels's sprout, Chinese cabbage, broccoli, kale and artichoke.

UNIT III

Amaranth, celery, parsley, parsnip, lettuce, rhubarb, spinach, basella, bathu (chenopods) and chekurmanis.

UNIT IV

Elephant foot yam, lima bean, winged bean, vegetable pigeon pea, jack bean and sword bean, Sweet gourd, spine gourd, pointed gourd, Oriental pickling melon and little gourd (kundru).

Practical

Identification of seeds; botanical description of plants; layout and planting; cultural practices; short-term experiments of underexploited vegetables.

Suggested Readings

Bhat KL. 2001. *Minor Vegetables - Untapped Potential*. Kalyani Publishers.

Indira P & Peter KV. 1984. *Unexploited Tropical Vegetables*. Kerala. Agricultural University, Kerala.

Peter KV. (Ed.). 2007-08. *Underutilized and Underexploited Horticultural Crops*. Vols. I-IV. New India Publ. Agency.

Rubatzky VE & Yamaguchi M. (Eds.). 1997. *World Vegetables: Principles, Production and Nutritive Values*. Chapman & Hall

Srivastava U, Mahajan RK, Gangopadyay KK, Singh M & Dhillon BS. 2001. *Minimal Descriptors of Agri-Horticultural Crops*. Part-II: *Vegetable Crops*. NBPGR, New Delhi.

ENG551 TECHNICAL WRITING AND COMMUNICATIONS SKILLS 0+1

Practical

Technical Writing - Various forms of scientific writings- theses, technical papers, reviews, manuals, etc; Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review

of literature, material and methods, experimental results and discussion); Writing of abstracts, summaries, précis, citations etc.; commonly used abbreviations in the theses and research communications; illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations; Writing of numbers and dates in scientific write-ups; Editing and proof-reading; Writing of a review article.

Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks); Error analysis (Common errors); Concord; Collocation; Phonetic symbols and transcription; Accentual pattern: Weak forms in connected speech: Participation in group discussion: Facing an interview; presentation of scientific papers.

Suggested Readings

Chicago Manual of Style. 14th Ed. 1996. Prentice Hall of India.

Collins' Cobuild English Dictionary. 1995. Harper Collins.

Gordon HM & Walter JA. 1970. *Technical Writing*. 3rd Ed. Holt, Rinehart & Winston.

AGS 503 INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN AGRICULTURE 0+1

UNIT I

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPs Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs;

UNIT II

Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks,

UNIT III

Protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection;

UNIT IV

National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Suggested Readings

Erbisch FH & Maredia K.1998. *Intellectual Property Rights in Agricultural Biotechnology*. CABI.

Ganguli P. 2001. *Intellectual Property Rights: Unleashing Knowledge Economy*. McGraw-Hill.

AGS504 BASIC CONCEPTS IN LABORATORY TECHNIQUES 0+1

Practical

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccumets; washing, drying and sterilization of glassware; Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution; Handling techniques of solutions; Preparation of different agro-chemical doses in field and pot applications; Preparation of solutions of acids; Neutralisation of acid and bases; Preparation of buffers of different strengths and pH values. Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath; Electric wiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability; Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy.

Suggested Readings

Furr AK. 2000. *CRC Hand Book of Laboratory Safety*. CRC Press.

Gabb MH & Latchem WE. 1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co

AGS505 AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES 1+0

UNIT I

History of agriculture in brief; Global agricultural research system: need, scope, opportunities, Sectionals; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR):

UNIT II

International Agricultural Research Centres (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility. Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

UNIT III

Concept and connotations of rural development, rural development policies and strategies, Rural development programmes: CommSectiony Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme, Integrated Rural Development Programme (IRDP)

UNIT IV

Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/Non-Governmental Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

Suggested Readings

Bhalla GS & Singh G. 2001. *Indian Agriculture - Four Decades of Development*. Sage Publ.

Punia MS. *Manual on International Research and Research Ethics*. CCS, Haryana Agricultural University, Hisar.

Rao BSV. 2007. *Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives*. Mittal Publ.

LIB101 LIBRARY AND INFORMATION SERVICES 0+1

Practical

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-resources access methods.

Suggested Readings

Wu Diana Yuhfen and Liu Mengxiong. 2001 Academic librarianship: changing roles in the digital age. Available at <http://www.sssu.edu/ridwu/academic> librarianship P&F. Accessed march 10, 2008

Library. 2004 Encyclopedia Britannica premium service http://www.britannica.com/eb/article_eu=09616 Accessed march 10, 2008

Young, P.V. (1984). Scientific social survey and research. Rev. 4th Ed. Prentice Hall, New Delhi.

<https://guides.library.manoa.hawaii.edu/PlantPath/Books>

<https://unl.libguides.com/c.php?g=51695&p=334113>

<https://libraries.unl.edu/citation-tools>

EVS658

DISASTER MANAGEMENT

1+0

UNIT I

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 II

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

UNIT III

Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs

UNIT IV

Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

Suggested Readings

Gupta HK. 2003. *Disaster Management*. Indian National Science Academy. Orient Blackswan.

Hodgkinson PE & Stewart M. 1991. *Coping with Catastrophe: A Handbook of Disaster Management*. Routledge.

Sharma VK. 2001. *Disaster Management*. National Centre for Disaster Management, India.

MTH 670

STATISTICAL METHODS FOR APPLIED SCIENCES

3+1

UNIT I

Classification, tabulation and graphical, representation of data. Box-plot, Descriptive statistics. Exploratory data analysis;

UNIT II

Measures of central tendency- Mean, Median, Mode, Geometric mean, Harmonic mean. Measures of Dispersion- Range, Quartile deviation, Mean deviation, Standard deviation.

UNIT III

Theory of probability. Random variable and mathematical expectation. Discrete and continuous probability distributions. Correlation and regression

UNIT IV

Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications. Concept of sampling distribution: chi-square, t and F distributions. Tests of significance based on Normal, chi-square, t and F distributions.

Practical

Exploratory data analysis, Box-Cox plots; Fitting of distributions~Binomial, Poisson, Negative Binomial, Normal; Large sample tests, testing of hypothesis based on exact sampling distributions-chi square, t and F; Confidence interval estimation and point estimation of parameters of binomial, Poisson and Normal distribution; Correlation and regression analysis, fitting of orthogonal polynomial regression; applications of dimensionality reduction and discriminant function analysis; Nonparametric tests.

Suggested Readings

Anderson TW. 1958. An Introduction to Multivariate Statistical Analysis. John Wiley.

Goon AM, Gupta MK & Dasgupta B. 1977. An Outline of Statistical Theory. Vol. I

Goon AM, Gupta MK & Dasgupta B. 1983. Fundamentals of Statistics. Vol. I.

Hoel PG. 1971. Introduction to Mathematical Statistics. John Wiley.

CSA559

COMPUTER FUNDAMENTALS AND PROGRAMMING

2+1

UNIT I

Computer Fundamentals - Number systems: decimal, octal, binary and hexadecimal; Representation of integers, fixed and floating point numbers, character representation; ASCII, EBCDIC.

UNIT II

Functional units of computer, I/O devices, primary and secondary memories. Programming Fundamentals with C - Algorithm, techniques of problem solving, flowcharting, stepwise refinement; Representation of integer, character, real, data types; Constants and variables; Arithmetic expressions, assignment statement, logical expression.

UNIT III

Sequencing, alteration and iteration; Arrays, string processing. Sub-programs, recursion, pointers and files.

UNIT IV

Program correctness; Debugging and testing of programs.

Practical Conversion of different number types; Creation of flow chart, conversion of algorithm/flowchart to program; Mathematical operators, operator precedence; Sequence, control and iteration; Arrays and string processing; Pointers and File processing.