

## **COURSES FOR Ph. D. PROGRAMME IN HORTICULTURE**

<b>Course Code</b>	<b>Course Title</b>	<b>Credit</b>	<b>Max. Marks</b>
DPH-HORT-101	Research Methodology	4Cr (2+2)	100
<b>* One Optional Course out of the followings</b>			
DPH-HORT-102 A	Advances in Fruits Production*	4Cr (3+1)	100
DPH-HORT-102 B	Advances in Vegetable Production		
DPH-HORT-102 C	Advances in Ornamental Crop Production Technology*		
DPH-HORT-102 D	Advances in Production Technology of Spices, Medicinal & Aromatic Crops*		
DPH-HORT-102 E	Post Harvest Technology for Horticulture Crops*		
DPH-HORT-103	Nutritional Requirements of Horticultural Crops	4Cr (3+1)	100
DPH-HORT-104	Plant Tissue Culture in the Improvement of Horticultural Crops	4Cr (3+1)	100
CPE-RPE	Research and Publication Ethics (RPE)	2Cr (1 +1)	100

## **DPH-HORT-101: RESEARCH METHODOLOGY**

**4Cr (2+ 2)**

### **Objective**

To keep update with latest development and trends in research meteorology of horticultural crops.

### **UNIT-I**

What is research, its methodology, development of research questions and designing of research projects?

### **UNIT-II**

Leaf sampling and tissue analysis, Innovative techniques in IPNM, IPDM, IPM

### **UNIT-III**

Qualitative and quantitative determination of important quality traits of horticultural crops,

### **UNIT-IV**

Statistical approaches in horticultural crops research and current research methodologies.

### **UNIT-V**

Use of biotechnological tools for improvement of Horticultural Crops

### **UNIT-VI**

Laboratory exercises on bioassay and application of plant bio regulators.

### **UNIT-VII**

Role of Computer, data digitalization and ICT in Horticultural Research and Development.

### **Suggested Readings:**

Bhutani, RC. 2003. Fruit and vegetable preservation. Biotech Books.

Chadha, KL, Ravindran, PN and Sahijram L. 2000. *Biotechnology in Horticultural and Plantation Crops*. Malhotra Publ. House.

Haid, NF. and Salunkhe, SK. 1997. Post Harvest Physiology and Handling of Fruits and Vegetables. Grenada Publ.

Kothari, C. R. (2018), Research Methodology-methods and techniques, New Age International.

Kaloo, G and Singh, K. 2001. *Emerging Scenario in Vegetable Research and Development*.

Research periodicals and Book Publ. House.

Ranganna, S. 1997. Hand Book of Analysis and Quality Control for Fruit and Vegetables products. Tata McGraw-Hill.

Sahu, P. K. and Das, A. K. (2009). Agriculture and applied statistics, Vol-I, II. *Kalyani Publishers, New Delhi*.

Shankar, G. *Practical Manual in Horticulture*. Allahabad

Sudheer, KP and Indira, V. 2007. Post Harvest Technology of Horticultural Crops. New India Publ. Agency.

**Objective**

To keep abreast with latest developments and trends in production technology of fruit crops

**Theory**

National and International scenario in fruit production, Recent advance in propagation-root stock influence, planting system, High density planting, crop modelling, Precision farming, decision support systems-aspects of crop regulation- physical and chemical regulations effects on physiology and development, influence of stress effects, integrated and modern approaches in water and nutrient management, total quality managements(TQM)-Current topics.

**Crops**

**UNIT I:** Mango and banana

**UNIT II:** Papaya, grapes and citrus

**UNIT III:** Guava, pomegranate

**UNIT IV:** Pineapple,

**UNIT V:** Apple, pear, peach,

**UNIT VI:** apricot, cherr ies and nut crops

**UNIT VII:** Post harvest management with value addition, Bio control of pests & diseases, quality regulation mechanism, role of honey bees in fruit production.

**Practical**

Survey of existing fruit cropping systems and development of high density orchard, estimating nutrient deficiency-modern methods of irrigation and quality analysis of fruits, use of plant growth regulation.

**Suggested Readings**

Bose, TK Mitra SK. and Rathore, DS. (Eds.). 1988. Temperate fruits – Horticulture. Allied Publ.

Bose, TK, Mitra SK and Sanyal, D. (Eds.). 2001. Fruits –Tropical and Subtropical. Naya Udyog.

Bose, TK, Mitra, SK, Farooqi, AA and Sadhu, MK., 1999.tropical Horticulture. Vol. I. Naya prokash.

Chadha, KL and Pareek OP. (Eds.). 1996. Advance in Horticulture. Vol. . IIIV. Malhotra Publshing House.

Chadha, KL, 2001. Handbook of Horticulture, ICAR.

Nakasone, HY and Pauli, RE. 1998. Tropical Fruits. CABI.

Radha, T and Mathew, L. 2007. Fruit Crops. New India Publ. Agency.

## **DPH-HORT- 102 B: ADVANCES IN VEGETABLE PRODUCTION 4Cr (3 + 1)**

**Objective:** To keep abreast with latest developments and trends in production technology of vegetable crops.

### **Theory:**

Present status and prospects of vegetable cultivation, nutritional and medicinal values, climate and soil as critical factors in vegetables production, choice of varieties, nursery management, modern concepts in water and weed management, physiological basis of growth, yield and quality as influenced by chemical and growth regulators, role of organic manures, inorganic fertilizers, micronutrients and Biofertilizers, response of genotypes to low and high nutrient management, nutritional deficiencies, disorders and correction measure, different cropping systems, mulching, containerized culture for year round vegetable production, low cost polyhouse, net house production, crop modelling, organic gardening, vegetables production for pigment, export and processing of:

**UNIT I:** Solanaceous crops (Tomato, Brinjal, Chilli, Sweet pepper and Potato)

**UNIT II:** Cole crops (Cauliflower, Cabbage, Broccoli and Knol- khol etc.)

**UNIT III:** Cucurbitaceous crops (Gourds and melons)

**UNIT IV:** Root (Radish, Carrot, Beet root & Turnip) and Tuber crops (sweet potato, tapioca, elephant foot yam & taro)

**UNIT V:** Leafy vegetables (Spinach beet, spinach, Amaranthus etc.) and Leguminous crops (French beans, Cowpea, Cluster bean and peas)

**UNIT VI:** Bulb crops (Onion and Garlic), Bhendi and Underutilized vegetables.

### **Practical**

Research and development of vegetables in India, Nursery management, soil management, water management, manure and fertilizers, weed management, mulching, organic vegetable production, diagnosis of nutritional and physiological disorders, plant growth substances in vegetable production, protected cultivation, practices in herbicide applications, maturity indices, quality analysis, marketing, survey of the above listed crops, visit to vegetable research farms and packing houses.

### **Suggested Readings:**

Bose, T. K. and Som, M.G. (1990). Vegetable Crops of India. Naya Prokash.

Bose, T. K., Kabir, J., Maity, T. K., Parthasarathy, V. A. and Som, M.G. (2003). Vegetable crops Vols. I-III. Naya Udyog.

Brewster, J.L. 1994. Onions and other vegetable Alliums. C.A.B.I.

Fageria, M. S., Arya, P.S. and Choudhary, K. A. (2018). Text Book on Vegetable crops, Breeding and Seed production, , Vol. I, Kalyani Publishers.

Fageria, M.S., Choudhary, B. R., and Dhaka, R. S. (2018). Vegetable crops production technology text book, Vol-II, Kalyani Publishers.

Ghosh, S.P., Ramanujam, T., Jos, J.S., Moorthy, S.N. and Nair, R.G. (1988). Tuber Crops. Oxford and IBH.

Gopaladrishnan, T.R. (2007). Vegetable Crops. New India Publishing Agency.

Hazra, P., and Som, M.G. (2015). Vegetable Science, Kalyani Publishers.

Kallo, G. and Singh, K. (2001). Emerging Scenario in vegetable Research and Development, Research periodicals and Book Publ. House.

Kurup, G.T, Palanisami, M.S., Potty, V.P., Padmaja, G., Kabeerathuma, S. and Pallai, S.V. (1996). Tropical Tuber Crops. Problems, Prospects and future strategies. Oxford and IBH.

Mathew, D., (2016). Vegetable Science for Competitive Exams. Kalyani Publishers.

Nath, P. and Swami, K.R. M. (2016). Textbook of vegetable crops. ICAR

Rana, M.K. (2011). Fundamental of Vegetable production. New India Publication Agency.

Selvakumar, R. (2014). A textbook of Glaustas olericulture. New Vishal Publications.

Sin, M.T. and Onwueme, I.C. (1978). The Tropical Tuber Crops. John Wiley and Sons.

Singh, D. (2013) Vegetable Science. New Vishal Publications.

Singh, K.P., & Bahadur, A. (2015). Olericulture -II, vegetable production and improvments. Vol-II, Kalyani Publishers.

Singh, K.P., & Bahadur, A., (2014). Olericulture, fundamental of vegetable production. Vol-I, Kalyani Publishers.

Singh, NP, Bhardwaj, AK, Kumar, A and Singh, KM. 2004. Modern Technology on Vegetable Production. International Book Distr. Co.

**DPH-HORT-102C: ADVANCES IN ORNAMENTAL CROP PRODUCTION  
TECHNOLOGY 4Cr (3 + 1)**

**Objective**

To acquire the knowledge about the latest developments and trends in production technology of ornamental.

**Theory**

**UNIT I**

R & D in Floriculture, Commercial flower production, Scope and importance, Global Scenario in flower production and trade, varietal wealth and diversity, cut flowers, dry flowers and floral oil trade, Act & regulation including IPR, Agric Export Zones.

**UNIT II**

Propagation and multiplication, Soil and climate, Greenhouse management, soil/media decontamination techniques, Micro irrigation, nutrition and fertigation, slow release fertilizers and Biofertilizers, influence of environmental parameters, light. Temperature, moisture, humidity and CO<sub>2</sub> on growth and flowering and regulation for quality flowers.

**UNIT III**

Harvest indices & Standards, Harvesting techniques, post-harvest handling precooling, pulsing, packing, transportation and Storage.

**UNIT IV**

Crop specific practices- rose, anthurium, orchids, carnation, gerbera, bird of paradise, jasminum species, marigold, Bulbous plants (Gladiolus, tuberose, tulip, liliun and narcissus).

**UNIT V**

Floral oil industry, floral concrete production, extraction methods of oil in crops like rose, jasmine and other flower crops.

**Practical**

Green house management, soil decontamination techniques, Mrcroirrigation, fertigation, special practices – pinching, netting disbudding, defoliation and chemical pruning, photoperiodic and chemical induction of flowering, Post-harvest handling, preparation of floral decorative, visit to commercial cut flower units and oil extractions units.

**Suggested Readings**

Acquaah, G., *Principles and practices of Horticulture*

Bhattacharjee, S.K. and De L.C. (2010). *Advanced commercial Floriculture* (2<sup>nd</sup> Ed.). Aavishkar Pub. & distributors.

Bhattacharjee, S.K. (2006). *Advances in Ornamental Horticulture*, Aavishkar Pub. & distributors.

Chadha, KL and Choudhary, M. L. 1992. *Ornamental Horticulture in India*. ICAR.

Kulkarni, B. S. (2016). *Floriculture and Landscaping*. Agro India Publication.

Lauria, A and Victor, HR. 2001. *Floriculture-Fundamentals and Practices*. Agrobios.

Randhawa, GS and Mukhopadhyaya, A. 1986. *Floriculture in India*. Allied Publ.

Singh, A. K. 2006. *Flower crop cultivation and management*. New India Publishing Agency.

**DPH-HORT-102D: ADVANCES IN PRODUCTION TECHNOLOGY OF SPICES,  
MEDICINAL AND AROMATIC CROPS** **4Cr (3+1)**

**Objective**

To impart basic knowledge about the importance and production technology of spices, medicinal and aromatic crops.

**Theory**

Introduction, importance of spice crops-historical accent, present status - national and international, future prospects, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, site selection, layout, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercropping, mixed cropping, intercultural operations, weed control, mulching, physiological disorders, harvesting, post harvest management, plant protection measures and seed planting material and micro-propagation, precision farming, organic resource management, organic certification, quality control, pharmaceutical significance and protected cultivation of:

**UNIT I**

Black pepper, cardamom, clove, cinnamon and nutmeg, allspice, turmeric, ginger and garlic,

**UNIT II**

Coriander, fenugreek, cumin, fennel, ajowain, dill, celery, vanilla and Saffron

**UNIT III**

Senna, Periwinkle, Coleus, Aswagandha, Glory, Sarpagandha, *Dioscorea* sp., *Aloe vera*, Isabgol, Poppy, Safed musli, *Stevia rebaudiana*, *Mucuna pruriens*

**UNIT IV**

Palmarosa, lemongrass, citronella, vetiver, geranium, artemisia, mentha, ocimum, eucalyptus, rosemary, thyme, patchouli, lavender, marjoram, oreganum.

**Practical**

Identification of seeds and plants, botanical description of plant, preparation of herbarium, propagation, nursery raising, field layout and method of planting, cultural practices, harvesting, drying, storage, packaging and processing, value addition, short term experiments on spice crops. Maturity standards, Extraction of secondary metabolites, Extraction of Essential oils, Project preparation for commercially important aromatic crops,

**Suggested Readings**

- Agarwal S, Sastry EVD & Sharma RK. 2001. *Seed Spices: Production, Quality, Export*. Pointer Publ.
- Arya PS. 2003. *Spice Crops of India*. Kalyani.
- Bhattacharjee SK. 2000. *Hand Book of Aromatic Plants*. Pointer Publ.
- Bose TK, Mitra SK, Farooqi SK & Sadhu MK (Eds.). 1999. *Tropical Horticulture*. Vol.I. Naya Prokash.
- Chadha KL & Rethinam P. (Eds.). 1993. *Advances in Horticulture*. Vols. IX-X. *Plantation Crops and Spices*. Malhotra Publ. House.
- Gupta S. (Ed.). *Hand Book of Spices and Packaging with Formulae*. Engineers India Research Institute, New Delhi.
- Kumar NA, Khader P, Rangaswami & Irulappan I. 2000. *Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants*. Oxford & IBH.
- Nybe EV, Miniraj N & Peter KV. 2007. *Spices*. New India Publ. Agency.
- Parthasarthy VA, Kandiannan V & Srinivasan V. 2008. *Organic Spices*. New India Publ. Agency.
- Peter KV. 2001. *Hand Book of Herbs and Spices*. Vols. I-III
- Atal CK & Kapur BM. 1982. *Cultivation and Utilization of Aromatic Plants*. RRL, CSIR, Jammu.

**DPH-HORT- 102 E: POST HARVEST TECHNOLOGY FOR HORTICULTURAL CROPS**  
**4Cr(3+1)**

**Objective**

To facilitate deeper understanding on principles and practices of postharvest management of horticultural crops.

**Theory**

**UNIT I**

Role of maturity indices, harvesting practices for specific market requirements, influence of pre-harvest practices on post harvest quality of fruits.

**UNIT II**

Physiology of ripening, ethylene evolution and ethylene management, factors leading to post-harvest loss.

**UNIT III**

Post harvest treatments prior to shipment, viz. chlorination, waxing, chemicals, biocontrol agents and natural plant products. Methods of storage ventilated, refrigerated, MAS, CA storage, physical injuries and storage disorders.

**UNIT IV**

Packaging methods and transport. Food processing, canning, fruit juices, beverages, pickles, jam, jellies, candies.

**UNIT V**

Dried and dehydrated products, nutritionally enriched products, fermented fruit beverages, processing, Waste management, Food safety standards.

**Practical**

Analyzing maturity stages of commercially important horticultural crops, improved packing and storage of important horticultural commodities, physiological loss in weight of fruits and vegetables, estimation of transpiration, respiration rate, ethylene release and study of vase life extension in cut flower using chemicals, estimation of quality characteristics in stored fruits and vegetables, cold chain management - visit to cold storage and CA storage units, visit to fruit and vegetable processing units, project preparation, evaluation of processed horticultural products.

**Suggested Readings**

Bhutani RC. 2003. *Fruit and Vegetable Preservation*. Biotech Books.

Chadha KL & Pareek OP. (Eds.). 1996 *Advances in Horticulture*. Vol. IV. Malhotra Publ. House.

Haid NF & Salunkhe SK. 1997. *Post Harvest Physiology and Handling of Fruits and Vegetables*. Grenada Publ.

Mitra SK. 1997. *Post Harvest Physiology and Storage of Tropical and Sub-tropical Fruits*. CABI.

Ranganna S. 1997. *Hand Book of Analysis and Quality Control for Fruit and Vegetable Products*. Tata McGraw-Hill.

Sudheer KP & Indira V. 2007. *Post Harvest Technology of Horticultural Crops*. New India Publ. Agency.

Willis R, Mc Glassen WB, Graham D & Joyce D. 1998. *Post Harvest. An 17*

*Introduction to the Physiology and Handling of Fruits, Vegetables and Ornamentals*. CABI.

## **DPH-HORT-103: NUTRITIONAL REQUIREMENT OF HORTICULTURAL CROPS 4Cr (3+1)**

### **Objective**

To acquaint students about the role of different nutrient elements in plant growth and development, Principles and practices of fertilizers and manures application and their management in production of different horticultural crops.

### **Theory**

#### **UNIT I**

Essential elements identified as plant nutrients, Factors affecting plant nutrition, nutrient uptake and their removal from soil.

#### **UNIT II**

Nutrient requirements of major fruits, vegetables and flowers.

#### **UNIT III**

Methods and techniques for evaluating the requirement of macro- and micro-elements, role of different Macro and micro-nutrients, their deficiency and toxicity disorders, corrective measures to overcome deficiency and toxicity disorders.

#### **UNIT IV**

Soil and foliar application of nutrients in major horticultural crops.

#### **UNIT V**

Fertigation in horticultural crop, bio-fertilizers and their use in IPNM systems.

### **Practicals**

Visual identification of nutrient deficiency symptoms in vegetable/ annual crops; Identification of organic, inorganic and bio-fertilizers and methods of application; Soil and tissue sample collection, preparation for macro- and micro-nutrient analysis; Analysis of soil physical and chemical properties. Soil pH, EC, Organic carbon determination in soil; 'P' analysis using spectrophotometer; 'N' analysis using auto analyzer; 'K' & 'Na' analysis using flame photometer; Ca, Mg, Fe and Zn analysis using Atomic absorption spectrophotometer; Visual identification of nutrient deficiency symptoms in fruit crops; Visual identification of nutrient deficiency symptoms in flowers, vegetable crops; Fertigation in glasshouse and field grown horticultural crops; Preparation of micro-nutrient solutions, their spray and soil applications.

### **Suggested Readings**

- Bould, C., Hewitt, E.J. and Needham, P. 1983. *Diagnosis of Mineral Disorders in Plants Vol.1 Principles*. Her Majesty's Stationery Office, London.
- Cooke, G.W. 1972. *Fertilizers for maximizing yield*. Grenada Publishing Ltd, London.
- Epstein, E. 1972. *Mineral Nutrition of Plants: Principles and Perspectives*. Wiley Eastern Ltd.
- Kanwar, J.S. 1976. *Soil Fertility- Theory and Practice*. ICAR, New Delhi.
- Marchner, Horst. 1995. *Mineral Nutrition of Higher Plants*, 2nd ed. Marschner, Academic Press Inc. San Diego, CA.
- Mengel, K. and Kirkby, E.A. 1987. *Principles of Plant Nutrition*. 4th ed. International Potash Institute, Worblaufen-Bern, Switzerland.
- Mitra, S.K., Sadhu, M.K. and Bose, T.K. (ed.). 1990. *Nutrition of Vegetable Crops*. Naya Prokash, Kolkata.
- Scaife, Alan and Turner, Mary. 1983. *Diagnosis of Mineral Disorders in Plants Vol. 2 Vegetables*. Her Majesty's Stationery Office, London.
- Tandon, H.L.S. 1992. *Management of Nutrient Interactions in Agriculture Fertilizer Development and Consultation Organization*, New Delhi.
- Westerman, R.L. (ed.) 1990. *Soil Testing and Plant Analysis*, 3rd. edition. Soil Science Society of America, Inc., Madison, WI.
- Yawalkar, K.S., Agarwal, J.P. and Bokde, S. 1972. *Manures and Fertilizers*. Third revised edn. Agri Horticultural Publishing House, Nagpur.



**DPH-HORT-104: PLANT TISSUE CULTURE IN THE IMPROVEMENT OF HORTICULTURAL CROPS** **4Cr (3+1)**

**Objective**

To familiarize the students and provide hands-on training on various techniques of plant tissue culture and their applications in improvement of horticultural crops.

**Theory**

**UNIT I**

Basic principles of plant tissue-culture, morphogenetic potential of higher plants and regeneration pathways.

**UNIT II**

Application of plant tissue culture techniques in crop improvement with emphasis on ornamental, fruit and vegetable crops, single cell and suspension culture, *in-vitro* mutagenesis, somaclonal variation, embryo culture and rescue, anther culture and haploid production.

**UNIT III**

Protoplast isolation, fusion and organogenesis, *Agrobacterium*-mediated genetic transformation and cryobiology.

**UNIT IV**

*In-vitro* germplasm conservation, genetic diversity analysis using DNA markers.

**Practicals:**

General acquaintance with a tissue culture laboratory; Methods of aseptic culture and sterilization procedure; Stock solutions and preparation of culture media; *In vitro* culture establishment and plant regeneration, Embryo culture and embryo rescue; Anther isolation and culture; *In vitro* mutagenesis using EMS and gamma irradiation; *In vitro* screening for NaCl tolerance; *Agrobacterium* mediated genetic transformation of tobacco; DNA isolation and RAPD analysis of plants; Techniques of low temperature germplasm storage, cryo-preservation and visit to NBPGRC cryobank.

**Suggested Readings:**

- Balasubramanian, D., Bryce, C.F.A., Dharmalingam, K., Green, J. and Jayamaran, K. 1998.
- Bojwani, S.S. and Razdan, M.K. 1983. Plant Tissue Culture: Theory and Practices, Elsevier, Amsterdam.
- Chadha, K.L., Ravindran, P.N. and Sahijaram, Leela 2000. Bio-technology in Horticulture and Plantation Crops. Malhotra Publishing House, New Delhi.
- Concepts in Biotechnology. University Press, India.
- Gupta, P.K. 1999. Elements of Biotechnology, Rastogi publications, Meerut, India.
- Hammerschlag Z.A. and Litz, R.E. 1997. Biotechnology of Fruit and Nut Crops, CABI, U.K.
- Primrose, S.B. 1987. Modern Biotechnology. Blackwell Scientific Co., USA.
- Razdan, M.K. 1993. An Introduction to Plant Tissue Culture. Oxford & IBH, Publishing Co. Pvt. Ltd., New Delhi.
- Singh, B.D. 1999. Biotechnology, Kalyani Publishers, Ludhiana.
- Street, H.E. 1973. Plant Tissue and Cell Culture. Blackwell Publications, London.
- Vasil, I.K. 1967. Cell Culture and Somatic Cell Genetics. Academic Press, London.

**Course Title:**

- **Research and Publication Ethics (RPE)** - Course for awareness about the publication ethics and publication misconducts.

**Course Level:**

- 2 Credit course (30 hrs.)

**Eligibility**

- M.Phil, Ph.D. students and interested faculty members (It will be made available to post graduate students at later date)

**Fees:**

- As per University Rules

**Faculty:**

- Interdisciplinary Studies

**Qualification of faculty members of the course:**

- Ph.D. in relevant subject areas having more than 10 years' of teaching experience

**About the Course:****Course Code: CPE-RPE****Overview**

- This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on- sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citation, h-index, Impact Factor etc.) and plagiarism tools will be introduced in this course.

**Pedagogy**

- Class room teaching, guest lectures, group discussion and practical sessions.

**Evaluation**

- Continuous assessment will be done through tutorials, assignments, quizzers and group discussions. Weightage will be given for active participation. Final written examination will be conducted at the end of the course.

**Course Structure**

- The course comprises of six modules listed in table below. Each module has 4-5 units.

Modules	Unit title	Teaching hours
Theory		
RPE 01	Philosophy and Ethics	4
RPE 02	Scientific Conduct	4
RPE 03	Publication Ethics	7
Practice		
RPE 04	Open Access Publishing	4
RPE 05	Publication Misconduct	4
RPE 06	Database and Research Metrics	7
<b>Total</b>		<b>30</b>

**Syllabus in detail:****THEORY**

- **RPE 01: PHILOSOPHY AND ETHICS (3 hrs.)**
  1. Introduction to philosophy: definition, nature and scope, concept, branches.
  2. Ethics: definition, moral philosophy, nature of moral judgement and reactions.
- **RPE 02: SCIENTIFIC CONDUCT (5 hrs.)**
  1. Ethics with respect to science and research
  2. Intellectual honesty and research integrity

3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)
  4. Redundant publications: Duplicate and overlapping publications, salami slicing
  5. Selective reporting and misrepresentation of data
- **RPE 03: PUBLICATION ETHICS (7 hrs.)**
    1. Publication ethics: definition, introduction and importance
    2. Best practices/standards setting initiatives and guidelines: COPE, WAME etc.
    3. Conflicts of interest
    4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
    5. Violation of publication ethics, authorship and contributorship
    6. Identification of publication misconduct, complaints and appeals
    7. Predatory publishers and journals

## **PRACTICE**

- **RPE 04: OPEN ACCESS PUBLISHING (4 hrs.)**
  1. Open access publications and initiatives
  2. SHERPA/RoMEO online resource to check publisher copyright & self archiving policies.
  3. Software tool to identify predatory publication developed by SPPU
  4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester etc.
- **RPE 05: PUBLICATION MISCONDUCT (4 hrs.)**
  - A. Group Discussions (2 hrs.)**
    1. Subject specific ethical issues, FFP, authorship
    2. Conflicts of Interest
    3. Complaints and appeals: examples and fraud from India and Abroad.
  - B. Software tools (2 hrs.)**

Use of plagiarism software like Turnitin, Urkund and other source software tools.
- **RPE 06: DATABASES AND RESEARCH METRICS (7 hrs.)**
  - A. Databases (4 hrs.)**
    1. Indexing databases
    2. Citation databases: Web of Science, Scopus etc.
  - B. Research Metrics (3 hrs.)**
    1. Impact Factor of Journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score.
    2. Metrics: h-index, g index, i10 index, altmetrics.