Maharshi Dayanand University, Rohtak

Department of Pharmaceutical Sciences

M. PHARM. PHARMACOGNOSY (MPG)

PROGRAM SPECIFIC OBJECTIVES

PSO1 Teach and provide adequate knowledge of the natural products and their ingredients.

PSO2 Demonstrate the various aspects of extraction, isolation and purification of natural compounds and optimization of all related procedures

PSO3 Do research for discovering compounds from natural sources for treatment of special diseases like AIDS, cancer, malaria, etc.

PSO4 To perform the biological assay of natural products and defining quality control methods for assurance of making standard products with desirable safety and efficacy.

PSO5 To manage the laws and policies related to the herbal medicine

SCHEME OF EXAMINATION

Table- Schemes for internal assessments and end semester examinations (Pharmacognosy)

Course Code	Course	Internal Assessment				End Semester Exams		Total
		Continuous	Sessional Exams		Total			
		Mode	Marks	Duration		Marks	Duration	Marks
SEMESTER I								
MPA101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPG101T	Advanced Pharmacognosy-1	10	15	1 Hr	25	75	3 Hrs	100
MPG102T	Phytochemistry	10	15	1 Hr	25	75	3 Hrs	100
MPG103T	Industrial Herbal drug technology	10	15	1 Hr	25	75	3 Hrs	100
MPG104P	Pharmacognosy Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
							Total	**650**
SEMESTER II								
MPG201T	Medicinal Plant biotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPG202T	Advanced Pharmacognosy-II	10	15	1 Hr	25	75	3 Hrs	100
MPG203T	Indian system of medicine	10	15	1 Hr	25	75	3 Hrs	100

MPG204T	Herbal cosmetics	10	15	1 Hr	25	75	3 Hrs	100
MPG205P	Pharmacognosy Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
							Total	**650**

Table- Schemes for internal assessments and end semester examinations

(Semester III& IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total
		Continuous	Sessional Exams		Total	Marks	Duration	Marks
		Mode	Marks	Duration				
SEMESTER III								
MRM101T	Research Methodology and Biostatistics	10	15	1 Hr	25	75	3 Hrs	100
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	50	-	-	50
-	Research work	-	-	-	-	350	1 Hr	350
							Total	**525**
SEMESTER IV								
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75
-	Research work and Colloquium	-	-	-	-	400	1 Hr	400
							Total	**500**

SYLLABUS

SEMESTER-I

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPA101T)

Course outcomes

After completion of course student is able to know,

CO1 The analysis of various drugs in single and combination dosage forms

CO2 Theoretical and practical skills of the instruments

CO3 Application of the analytical techniques in the standardization of the herbal drugs

THEORY **60 HOURS**

1 UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy.

IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier – Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy

Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

12 Hrs

2 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy.

12 Hrs

3 Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy

12 Hrs

4 Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography g) Affinity chromatography

12 Hrs

5 Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing

X ray Crystallography: Production of X rays, Different X ray methods, Bragg‘s law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.

12 Hrs

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.

2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.

3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.

4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.

5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.

6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.

7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series

ADVANCED PHARMACOGNOSY-1 (MPG101T)

Course Outcomes

Upon completion of the course, the student shall be able to

CO1 Know the advances in the cultivation and production of drugs

CO2 Know the various phyto-pharmaceuticals and their source & utilization and medicinal value.

CO3 Know the various nutraceuticals/herbs and their health benefits

Course Description

THEORY **60 Hours**

1. Plant drug cultivation: General introduction to the importance of Pharmacognosy in herbal drug industry, Indian Council of Agricultural Research, Current good agricultural practices, Current good cultivation practices, Current good collection practices, Conservation of medicinal plants- *Ex-situ* and *In-situ* conservation of medicinal plants.

12 Hrs

2. Marine natural products: General methods of isolation and purification, Study of Marine toxins, Recent advances in research in marine drugs, Problems faced in research on marine drugs such as taxonomical identification, chemical screening and their solution.

12 Hrs

3. Nutraceuticals: Current trends and future scope, Inorganic mineral supplements, Vitamin supplements, Digestive enzymes, Dietary fibres, Cereals and grains, Health drinks from natural origin, Antioxidants, Polyunsaturated fatty acids, Herbs as functional foods, Formulation and standardization of neutraceuticals, Regulatory aspects, FSSAI guidelines, Sources, name of marker compounds and their chemical nature, medicinal uses and health benefits of following i) Spirulina ii) Soya bean iii) Ginseng iv) Garlic v) Broccoli vi) Green and Herbal Tea vii) Flax seeds viii) Black cohosh ix) Turmeric.

12 Hrs

4. Phytopharmaceuticals: Occurrence, isolation and characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of following.

a) Carotenoids – i) α and β - Carotene ii) Xanthophyll (Lutein) b) Limonoids – i) d-Limonene ii) α – Terpineol c) Saponins – i) Shatavarins d) Flavonoids – i) Resveratrol ii) Rutin iii) Hesperidin iv) Naringin v) Quercetin e) Phenolic acids- Ellagic acid f) Tocotrienols and Tocopherols g) Andrographolide, glycolipids, gugulipids, withanolides, vascine, taxol

12 Hrs

5. Pharmacovigilance of drugs of natural origin: WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for biodrug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples.

12 Hrs

REFERENCES:

1) Cultivation of medicinal and aromatic crops, 1st edition, by AA Farooqui and B.S. Sreeramu. University Press, 2001.

2) Medicinal natural products (a biosynthetic approach), 1st edition, by Paul M. Dewick, John Wiley & Sons Ltd., England, 1998.

3) Natural Products from Plants, 1st edition, by Peter B. Kaufman, CRC Press, New York, 1998

4) Glimpses of Indian Ethano Pharmacology by P. Pushpangadam. Ulf Nyman. V.George Tropical Botanic Garden & Research Institute, 1995.

5) Natural products: A lab guide by Raphael Ikan , 2nd Edition, Academic Press 1991.

6) Pharmacognosy - G. E. Trease and W.C. Evans. 15th Edition W.B. Saunders Edinburgh, New York.

7) Pharmacognosy-Tyler, Brady, Robbers

8) Modem Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II

9) Recent Advances in Phytochemistry- Vol. 1&4: Scikel Runeckles- Appleton Century crofts.

10) Chemistry of Marine Natural Products- Paul J. Schewer 1973.

11) Marine Natural Products-Vol.I to IV.

12) Cultivation of Medicinal Plants by C.K. Atal & B.M. Kapoor.

13) Cultivation and Utilization of Aromatic Plants By C.K. Atal & B.M. Kapoor

14) Herbal Drug Industry by RD. Choudhary, 1st edition, Eastern Publisher, New Delhi, 1996.

15) Text book of Pharmacognosy by C.K.Kokate, Purohit, Ghokhale, 4th edition, Nirali Prakasshan, 1996.

16) Pharmacognosy and Pharmacobiotechnology by Ashutoshkar, New Age Publications, New Delhi.

17) Text Book of Pharmacognosy by T.E. Wallis

PHYTOCHEMISTRY (MPG102T)

Course outcomes

Upon completion of the course, the student shall be able to

CO1 Know the different classes of phytoconstituents and their properties and general process of natural product drug discovery

CO2 Know the process isolation, purification and identification of phytoconstituents

CO3 Know the process of characterization of the phytoconstituents.

THEORY **60 Hrs**

1. Biosynthetic pathways and Radio tracing techniques: Constituents & their Biosynthesis, Isolation, Characterization and purification with a special reference to their importance in herbal industries of following phyto-pharmaceuticals containing drugs:

a) Alkaloids: Ephedrine, Quinine, Strychynine, Piperine, Berberine, Taxol, Vincaalkoloids.

b) Glycosides: Digitoxin, Glycyrrhizin, Sennosides, Bacosides, Ginsenosides, Quercitin, Rutin.

c) Steroids: Hecogenin, guggulosterone and withanolides

d) Coumarin: Umbelliferone.

e) Terpenoids: Cucurbitacins

f) Carotenoids: Lycopene, β-carotene.

g) Camphor, Menthol, Eugenol.

12 Hrs

2. Drug discovery and development: History of herbs as source of drugs and drug discovery, the lead structure selection process, structure development, product discovery process and drug registration, Selection and optimization of lead compounds with suitable examples from anticancer, CNS cardiovascular drugs, antitubercular drugs and immunomodulators, Clinical studies emphasis on phase of clinical trials, protocol design for lead molecules.

12 Hrs

3. Extraction and Phytochemical studies: Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and other methods of extraction commonly used like microwave assisted extraction, and method of fractionation. Detection of different classes of phytoconstituents by latest CCCET, SCFE techniques including preparative HPLC and Flash column chromatography, AAS.

12 Hrs

4. Phytochemical finger printing: HPTLC and LCMS/GCMS characterization of extracts containing alkaloids, saponins, glycosides and flavanoids.

12 Hrs

5. Pharmacological screening: In vitro, In vivo screening techniques with reference to antiglycomerate, analgesics, antidiabetic, antilipidemic, anticancer, antiulcer, antiviral, antipsychotic, antilithiatic, Toxicity studies as per OECD guidelines, acute, chronic and clinical toxicity.

12 Hrs

REFERENCES:

1) Organic chemistry by I.L. Finar Vol.II

2) Pharmacognosy by Trease and Evans, ELBS.

3) Pharmacognosy by Tylor and Brady.

4) Text book of Pharmacognosy by Wallis.

5) Clark's isolation and Identification of drugs by A.C. Mottal.

6) Plant Drug Analysis by Wagner & Bladt.

7) Wilson and Gisvolds text book of Organic Medicinnal and Pharmaceutical Chemistry by Deorge. R.F.

8) The Chemistry of Natural Products, Edited by R.H. Thomson, Springer International

Edn. 1994.

9) Natural Products Chemistry Practical Manual by Anees A Siddiqui and SeemiSiddiqui

10) Organic Chemistry of Natural Products, Vol. 1&2. Gurdeep R Chatwal.

11) Chemistry of Natural Products- Vol. 1 onwards IWPAC.

12) Modem Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II

INDUSTRIAL HERBAL DRUG TECHNOLOGY (MPG103T)

Course Outcomes

By the end of the course the student shall be able to:-

CO1 Know the requirements for setting up the herbal/natural drug industry.

CO2 To know and understand the guidelines for quality of herbal/natural medicines and regulatory issues.

CO3 To know patenting/IPR of herbals/natural drugs and trade of raw and finished materials.

THEORY **60Hrs**

1. Herbal drug industry: Infrastructure of herbal drug industry involved in production of standardized extracts and various dosage forms. Current challenges in upgrading and modernization of herbal formulations. Entrepreneurship Development, Project selection, project report, technical knowledge, Capital venture, plant design, layout and construction. Pilot plant scale –up techniques, case studies of herbal extracts. Formulation production management.

12 Hrs

2. Regulatory requirements for setting herbal drug industry: Global marketing management. Indian and international patent law as applicable herbal drugs and natural products. Export – import (EXIM) policy, TRIPS, IPR. Quality assurance in herbal/natural drug products. Concepts of TDM, GMP, GLP, ISO-9000.

12Hrs

3. Monographs of herbal drugs: Study of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic pharmacopoeia, American herbal pharmacopoeia, British herbal pharmacopoeia, Siddha and Unani Pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.

12 Hrs

4. Testing of natural products and drugs: Effect of herbal medicines on clinical laboratory testing. Regulation and dispensing of herbal drugs. Stability testing of natural products, protocols.

12 Hrs

5. Patents: Indian and international patent laws, proposed amendments as applicable to herbal/natural products and process. Geographical indication, Copyright, Patentable subject maters, novelty, non obviousness, utility, enablement and best mode, procedure for Indian patent filing, patent processing, grant of patents, rights of patents, cases of patents, opposition and revocation of patents, patent search and literature, Controllers of patents.

12 Hrs

REFERENCES:

1. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.

2. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine by Pulok K Mukharjee (2003), Ist Edition, Business horizons Robert Verpoorte, New Delhi.

3. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.

4. The complete technology book on herbal perfumes and cosmetics, by H.Pande, National Institute of Industrial Research, Delhi.

5. Quality control of herbal drugs by Pulok K Mukarjee (2002), Ist Edition, Business Horizons Pharmaceutical Publisher, New Delhi.

6. PDR for Herbal Medicines (2000), 2nd Edition, Medicinal Economic Company, New Jersey.

7. Indian Herbal Pharmacopoeia (2002), Revised Edition, 1DMA, Mumbai.

8. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (1996), 4th Edition, Nirali Prakashan, New Delhi.

9. Text book of Pharmacognosy and Phytochemistry by Vinod D. RangarI (2002), Part I & II, Career Publication, Nasik, India.

10. Plant drug analysis by H.Wagner and S.Bladt, 2nd edition, Springer, Berlin.

11. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol.I, Eastern Publisher, New Delhi.

12. Phytochemical Dictionary. Handbook of Bioactive Compounds from Plants by J.B.Harborne, (1999), IInd Edition, Taylor and Francis Ltd, UK.

13. Herbal Medicine. Expanded Commission E Monographs by M.Blumenthal, (2004), IST Edition,

14. Drug Formulation Manual by D.P.S.Kohli and D.H.Shah (1998), II Edition, Eastern Publisher, New Delhi.

PHARMACOGNOSY PRACTICAL-I (MPGI04P)

Course outcomes

Upon completion of the subject student shall be able to;
CO1 Understand the different methods of extraction.
CO2 Understand the different methods of separation
CO3 Understand the methods of phytochemical screening.

Course content:

1. Analysis of pharmacopoeial compounds of natural origin and their formulations by UV Vis spectrophotometer

2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry

3. Analysis of recorded spectra of simple phytoconstituents

4. Experiments based on Gas Chromatography

5. Estimation of sodium/potassium by flame photometry

6. Developmernt of fingerprint of selected medicinal plant extracts commonly used in herbal drug industry viz. ashwagandha, tulsi, bael, amla, ginger, aloe, vidang, senna, lawronia by HPTLC method

7. Method of extraction

8. Phytochemical screening

9. Thin layer chromatography

10. Demonstration of HPLC- estimation of glycyeizin

11. Monograph analysis of clove oil

12. Monograph analysis of castor oil.

13. Identification of bioactive constituents from plant extracts

14. Formulation using qualitative and quantitative methods.

SEMESTER-II

MEDICINAL PLANT BIOTECHNOLOGY (MPG201T)

Course outcomes

Upon completion of the course, the student shall be able to

CO1 Know the process like genetic engineering in medicinal plants for higher yield of Phytopharmaceuticals.

CO2 Use the biotechnological techniques for obtaining and improving the quality of natural products/medicinal plants

CO3 Biotechnology in the areas of herbal.

THEORY 60Hrs

1. Introduction to Plant biotechnology: Historical perspectives, prospects for development of plant biotechnology as a source of medicinal agents. Applications in pharmacy and allied fields. Genetic and molecular biology as applied to pharmacognosy, study of DNA, RNA and protein replication, genetic code, regulation of gene expression, structure and complicity of genome, cell signaling, DNA recombinant technology.

12 Hrs

2. **Different tissue culture techniques:** Organogenesis and embryogenesis, synthetic seed and monoclonal variation, Protoplast fusion, Hairy root multiple shoot cultures and their applications. Micro propagation of medicinal and aromatic plants. Sterilization methods involved in tissue culture, gene transfer in plants and their applications.

12 Hrs

3. **Immobilisation techniques & Secondary Metabolite Production:**

Immobilization techniques of plant cell and its application on secondary metabolite Production. Cloning of plant cell: Different methods of cloning and its applications. Advantages and disadvantages of plant cell cloning. Secondary metabolism in tissue cultures with emphasis on production of medicinal agents. Precursors and elicitors on production of secondary metabolites.

12 Hrs

4. **Biotransformation and Transgenesis:**

Biotransformation, bioreactors for pilot and large scale cultures of plant cells and retention of biosynthetic potential in cell culture. Transgenic plants, methods used in gene identification, localization and sequencing of genes. Application of PCR in plant genome analysis.

12 Hrs

5. Fermentation technology:

Application of Fermentation technology, Production of ergot alkaloids, single cell proteins, enzymes of pharmaceutical interest.

12 Hrs

REFERENCES:

1. Plant tissue culture – Bhagwani, Vol 5. (Elsevier)
2. Plant cell and Tissue Culture (Lab. Manual) – J.R.M.M. Yeoman.
3. Elements in biotechnology by P. K. Gupta.
4. An introduction to plant tissue culture by M. K. Razdan.
5. Experiments in plant tissue culture by John H. D and Lorin W. R.
6. Pharmaceutical biotechnology by S. P. Vyas and V. K. Dixit.
7. Plant cell and tissue culture by Jeffrey W. Pollard and John M Walker.
8. Plant tissue culture by Dixon, Oxford Washington DC, 1985
9. Plant tissue culture by Street.
10. Pharmacognosy by G. E. Trease and W. C. Evans.
11. Biotechnology by Purohit and Mathur.
12. Biotechnological applications to tissue culture by Shargool.
13. Pharmacognosy by Virroo E. Tyler, Lynn R. Brady and James E. Robberrt.

ADVANCED PHARMACOGNOSY-II (MPG202T)

Course outcomes

Upon completion of the course, the student shall be able to

CO1 Know the validation of herbal remedies

CO2 Know the methods of detection of adulteration and evaluation techniques for the herbal drugs

CO3 To know the methods of screening of herbals for various biological properties

THEORY **60Hrs**

1. **Herbal remedies – Toxicity and Regulations:**

Herbals vs Conventional drugs, Efficacy of Herbal medicine products, Validation of herbal therapies, Pharmacodynamic and Pharmacokinetic issues.

12 Hrs

2. **Adulteration and Deterioration:** Introduction, Types of Adulteration/ Substitution of Herbal drugs, Causes and Measures of Adulteration, Sampling Procedures, Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, heavy metals, pesticide residues, phytotoxin, microbial contamination in herbs fruital formulation.

12 Hrs

3. **Ethnobotany and Ethnopharmacology:** Ethnobotany in herbal drug evaluation, Impact of Ethnobotany in traditional medicine, New development in herbals, Bioprospecting tools for drug discovery, Role of Ethnopharmacology in drug evaluation, Reverse Pharmacology.

12 Hrs

4. **Analytical Profiles of herbal drugs:** *Andrographis paniculata, Boswellia serata, Coleus forskholii, Curcuma longa, Embelica officinalis, Psoralea corylifolia.*

12 Hrs

5. **Biological screening of herbal drugs:** Introduction and Need for Phyto- Pharmacological Screening, New Strategies for evaluating Natural Products, *In vitro* evaluation techniques for Antioxidants, Antimicrobial and Anticancer drugs. In vivo evaluation techniques for Anti-inflammatory, Antiulcer, Anticancer, Wound healing, Antidiabetic, Hepatoprotective, Cardio protective, Diuretics and Antifertility.

12 Hrs

REFERENCES:

1. Glimpses of Indian Ethano Pharmacology by P. Pushpangadam. Ulf Nyman. V. George Tropical Botanic Garden & Research Institute, 1995.

2. Natural products: A lab guide by Raphael Ikan , 2nd Edition, Academic Press1991.

3. Pharmacognosy - G. E. Trease and W.C. Evans. 15th Edition W.B. Saunders Edinburgh, New York.

4. Pharmacognosy-Tyler, Brady, Robbers

5. Modem Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II

6. Herbal Drug Industry by RD. Choudhary, 1st edition, Eastern Publisher, New Delhi, 1996.

7. Text book of Pharmacognosy by C.K.Kokate, Purohit, Ghokhale, 4th edition, Nirali Prakasshan, 1996.

8. Text Book of Pharmacognosy by T.E. Wallis

9. Quality control of herbal drugs by Pulok K Mukarjee (2002), Ist Edition, Business Horizons Pharmaceutical Publisher, New Delhi.

10. Indian Herbal Pharmacopoeia (2002), Revised Edition, 1DMA, Mumbai.

11. Text book of Pharmacognosy and Phytochemistry by Vinod D. RangarI (2002), Part I & II, Career Publication, Nasik, India.

12. Plant drug analysis by H.Wagner and S.Bladt, 2nd edition, Springer, Berlin.

13. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol.I, Eastern Publisher, New Delhi.

14. Herbal Medicine. Expanded Commission E Monographs by M.Blumenthal, (2004), IST Edition.

INDIAN SYSTEMS OF MEDICINE (MPG203T)

Course outcome

After completion of the course, student is able to

CO1 To understand the basic principles of various Indian systems of medicine

CO2 To now the clinical research of traditional medicines, Current Good Manufacturing

CO3 Practice of Indian systems of medicine and formulation.

THEORY

60Hrs

1. Fundamental concepts of Ayurveda, Siddha, Unani, and Homoeopathy systems of medicine:

Different dosage forms of the ISM **Ayurveda:** Chronological development of Charak Samhita, Sushrut Samhita and Kashyapa Samhita. Ayurvedic Pharmacopoeia Analysis of Ayurvedic Formulations and crude drugs with references to: Identity, purity and quality of crude drugs. **Siddha:** Gunapadam (Siddha Pharmacology), raw drugs/Dhatu/Jeevam in siddha system of medicine, Purification process (Suddhi).

12Hrs

2. Naturopathy, Yoga and Aromatherapy practices:

a) Naturopathy - Introduction, basic principles and treatment modalities.

b) Yoga - Introduction and Streams of Yoga. Asanas, Pranayama, Meditations and Relaxation techniques.

c) Aromatherapy – Introduction, aroma oils for common problems, carrier oils.

12 Hrs

3.**Formulation development of various systems of medicine:** Salient features of the techniques of preparation of some of the important class of Formulations as per Ayurveda, Siddha, Homeopathy and Unani Pharmacopoeia and texts. Standardization, Shelf life and Stability studies of ISM formulations.

12 Hrs

4. Schedule T – Good Manufacturing Practice of Indian systems of medicine:

Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records. Quality assurance in herbal drug industry of GAP, GMP and GLP in traditional system of medicine. Preparation of documents for new drug application and export registration. Challenges in monitoring the safety of herbal medicines: Regulation, quality assurance and control, National/regional pharmacopoeias.

12 Hrs

5. TKDL, Geographical indication skill, Government skills in AYUSH, ISM, CCRAS, CCRS, CCRH, CCRU.

12 Hrs

REFERENCES:

1. Ayurvedic Pharmacopoeia (2004), The Controller of Publications, Civil Lines, Govt. of

India, New Delhi.

2. Hand Book on Ayurvedic Medicines by H.Panda National Institute of Industrial Research,

New Delhi.

3. Ayurvedic System of Medicine by Kaviraj Nagendranath Sengupata (1998), 2nd Revised Edition, Sri Satguru Publications, New Delhi.

4. Ayurvedic Pharmacopoeia. Formulary of Ayurvedic Medicines (2000), IMCOPS, Chennai.

5. Homeopathic Pharmacopoeia. Formulary of Homeopathic Medicines (2004), IMCOPS, Chennai.

6. Homeopathic Pharmacy An introduction & Hand book by Steven B. Kayne (1997), Churchill Livingstone, New York.

7. Indian Herbal Pharmacopoeia (2002), Revised Edition, 1DMA, Mumbai.

8. British Herbal Pharmacopoeia British (1990), Herbal Medicine Association, UK.

9. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine by Pulok K Mukharjee (2003), First edition, Business Horizons, New Delhi.

10. Indian System of Medicine and Homeopathy in India (2001), Planning and Evaluation Cell, Govt.of India, New Delhi.

11. Essential of Food and Nutrition by Swaminathan (1999), Bappco, Bangalore.

12. Clinical Dietitics and Nutrition by F.P. Antia (1997), 4th Edi, Oxford Universith Press, Delhi.

13. Yoga- The Science of Holistic Living by V.K.Yoga (2005), Vivekananda Yoga Prakashna Publishing, Bangalore.

HERBAL COSMETICS (MPG204T)

Course outcomes

After completion of the course, student is able to

CO1 Understand the basic principles of various herbal/natural cosmetic preparations

CO2 Current Good Manufacturing Practices of herbal/natural cosmetics as per the regulatory authorities

CO3 Regulatory requirements for the herbal based cosmetics

THEORY

60Hrs

1. **Introduction:** Herbal/natural cosmetics, Classification& Economic aspects. Regulatory Provisions relation to manufacture of cosmetics: - License, GMP, offences & Penalties, Import & Export of Herbal/natural cosmetics, Industries involved in the production of Herbal/natural cosmetics**.**

12 Hrs

2. **Herbal Cosmetics for the skin:** Physiology and chemistry of skin and pigmentation, hairs, scalp, oral and nail, Cleansing cream, Lotions, Vanishing and Foundation creams, Anti- sun burn preparations, Moisturizing cream , deodorants, Face powders, Face packs, Lipsticks, Bath products, soaps and baby product, Preparation and standardisation of the following : Shampoos, Conditioners, Tonic, Bleaches, Colorants, Depilatories and Hair oils, Dentifrices and Mouth washes & Tooth Pastes, Cosmetics for Nails**.** **12 Hrs**

3. **Cosmeceuticals of herbal and natural origin:** Hair growth formulations, Fairness formulations. **12 Hrs**

4. Commonly used herbal cosmetics, raw materials, preservatives, surfactants, humectants, oils, colours, and some functional herbs, preformulation studies, compatibility studies, possible interactions between chemicals and herbs, design of herbal cosmetic formulation.

12 Hrs

5. **Analysis of Cosmetics, Toxicity screening and test methods:** Quality control and toxicity studies as per Drug and Cosmetics acts**.**

12 Hrs

REFERENCES:

- Panda H. 2007. Herbal Cosmetics (Hand book), Edition I, Asia Pacific Business Press Inc, New Delhi.
- Thomson EG. 2006. Modern Cosmetics, Edition I, Universal Publishing Corporation, Mumbai.

 P.P.Sharma. 2008. Cosmetics- Formulation, Manufacturing & Quality Control, Edition 4, Vandana Publications, New Delhi.

 Supriya K B. 2005. Handbook of Aromatic Plants, Edition II(Revised and Enlarged), Pointer Publishers, Jaipur.

 Skaria P. 2007. Aromatic Plants (Horticulture Science Series Vol. 1) , Edition I, New India Publishing Agency, New Delhi.

 Kathi Keville and Mindy Green.1995. Aromatheraphy (A Complete Guide to the Healing Art), Edition I, Sri Satguru Publications, New Delhi.

 Chattopadhyay PK. 2000. Herbal Cosmetics & Ayurvedic Medicines (EOU), Edition I, National Institute of Industrial Research, Delhi.

 Balsam MS & Edward Sagarin. 2008. Cosmetics Science and Technology, Edition II (Vol-II), Wiley Interscience, New York.

PHARMACOGNOSY PRACTICAL-II (MPG205P)

Course outcomes

After completion of the course, student is able to

CO1 Isolate the different active constituents form the plants

CO2 Identify the presence of the secondary metabolites present in the different parts of the plants

CO3 Standardization of the various herbal dosage forms.

Practicals

1. Isolation of nucleic acid from cauliflower heads

2. Isolation of RNA from yeast

3. Quantitative estimation of DNA

4. Immobilization of whole cell

5. Establishment of callus culture

6. Establishment of suspension culture

7. Estimation of aldehyde

8. Estimation of phenolic content in herbal raw materials

9. Estimation of alkaloid content in herbal raw materials

10. Estimation of flavonoid content in herbal raw materials

11. Preparation and standardization of various simple dosage forms from Ayurvedic, siddha, homoeopathy and Unani formulary

12. Preparation of certain Aromatherapy formulations

13. Herbal cosmetic formulation such as lip balm, lipstick, facial cream, herbal hair and nail care products

14. Evaluation of herbal tablets and capsules

15. Dermatological preparation like sunscreen, UV protection cream, skin care formulations for fungal and dermato reaction

16. Formulation of cough syrup