GURU NANAK INSTITUTE OF PHARMACEUTICAL SCIENCE & TECHNOLOGY

(An autonomous institute under MAKAUT)

M.PHARM SYLLABUS

Regulation 2020

2020-21

Table of Contents

INDEX

Table : Course of Study for M. Pharm. (Pharmacognosy)

SEMESTER I

Course Code	Name of the course	Credit hours	Credit points	Hrs./wk	Full Marks
THEORY					
R20_MPG101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
R20_MPG102T	Advanced Pharmacognosy - I	4	4	4	100
R20_MPG103T	Phytochemistry	4	4	4	100
R20_MPG104T	Industrial Pharmacognostical Technology	4	4	4	100
PRACTICAL					
R20_MPG105P	Pharmacognosy Practical - I	12	6	12	200
R20_MPG106	Seminar/Assignment	7	4	7	100
Total		**35**	**26**	**35**	**700**

SEMESTER II

Course Code	Name of the course	Credit hours	Credit points	Hrs./wk	Full Marks
THEORY					
R20_MPG201T	Medicinal Plant Biotechnology	4	4	4	100
R20_MPG202T	Advanced Pharmacognosy - II	4	4	4	100
R20_MPG203T	Indian Systems of Medicines-Theory	4	4	4	100
R20_MPG204T	Herbal Cosmetics	4	4	4	100
PRACTICAL					
R20_MPG205P	Pharmacognosy Practical - I	12	6	12	200
R20_MPG206	Seminar/Assignment	7	4	7	100
Total		**35**	**26**	**35**	**700**

SEMESTER III

Course Code	Name of the course	Credit hours	Credit points	Hrs./wk	Full Marks
THEORY					
R20_MPT384T	Research Methods and Biostatistics	4	4	4	100
R20_MPT381	Journal Club	1	1	1	100
R20_MPT391	Discussion/Presentation	2	2	2	100
R20_MPT392	Research Work	28	14		100
Total		**35**	**21**	**7**	**400**

SEMESTER IV

Course Code	Name of the course	Credit hours	Credit points	Hrs./wk	Full Marks
R20_MPT481	Journal Club	1	1	1	100
R20_MPT491	Discussion/Final Presentation	3	3	3	100
R20_MPT492	Research Work	31	16		100
R20_MPT482	Co-curricular Activities	3	3	3	100
Total		**38**	**23**	**7**	**400**

Table - Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	23
Total Credit Points	96

REGULATIONS

1. Short Title and Commencement

These regulations shall be called as "The Revised Regulations for the Master of Pharmacy (M. Pharm.) Degree Program - Credit Based Semester System (CBSS) of the Pharmacy Council of India, New Delhi". They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by the authorities of the university.

2. Minimum qualification for admission

A Pass in the following examinations

a) B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks (aggregate of 4 years of B.Pharm.)

b) Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B.Pharm.)

3. Duration of the program

The program of study for M.Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Phamacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from the month of December/January to May/June in every calendar year.

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly the credit associated with any of the other academic, co/extracurricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

7.1. Credit assignment

7.1.1. Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and a multiplier of half (1/2) for practical (laboratory) hours.Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2. The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by 1/2. Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

7.2. Minimum credit requirements

The minimum credit points required for the award of M. Pharm. degree is 95. However based on the credit points earned by the students under the head of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments, Research work, Discussions with the supervisor, Journal club and Co-Curricular activities over the duration of four semesters. The credits are distributed semester-wise as shown in Table 14. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

8. Academic work

A regular record of attendance both in Theory, Practical, Seminar, Assignment, Journal club, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective courses.

SYLLABUS

Semester I

PHARMACOGNOSY

1ST SEMESTER

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES

(R20_MPG101T)

SCOPE

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about,

- Chemicals and Excipients
- The analysis of various drugs in single and combination dosage forms
- Theoritical and practical skills of the instruments

THEORY 60 Hrs

1. (a) UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. 10 Hrs

(b) 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, Data Interpretation.

(c) Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence (Characterestics of drugs that can be analysed by flourimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

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

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 10 Hrs

resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy.

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. 10 Hrs

4. Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: 10 Hrs

(a) Thin Layer chromatography
(b) High Performance Thin Layer Chromatography
(c) Ion exchange chromatography
(d) Column chromatography
(e) Gas chromatography
(f) High Performance Liquid chromatography
(g) Ultra High Performance Liquid chromatography
(h) Affinity chromatography
(i) Gel Chromatography

5. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: 10 Hrs

(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.

6. Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. 10 Hrs

(a) Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications.

(b) Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA).

(c) TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications

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, Vol 11, Marcel. Dekker Series

8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.

9. Textbook of Pharmaceutical Analysis, KA. Connors, 3rd Edition, John Wiley & Sons, 1982.

ADVANCED PHARMACOGNOSY – I

(R20_MPG102T)

SCOPE

To learn and understand the advances in the field of cultivation and isolation of drugs of natural origin, various phytopharmaceuticals, nutraceuticals and their medicinal use and health benefits.

Objectives

After completion of course student is able to know about,

- After completion of course student is able to know about,
- Advances in the cultivation and production of drugs
- Various phyto-pharmaceuticals and their source, its utilization and medicinal value.
- Various nutraceuticals/herbs and their health benefits
- Drugs of marine origin
- Pharmacovigilance of drugs of natural origin

THEORY 60 Hrs

1. Plant drug cultivation: General introduction to the importance of Pharmacognosy in herbal drug industry, Indian Council of HIS 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 of 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 - 12 Hrs

(i) Spirulina (ii) Soya bean (iii) Ginseng (iv) Garlic (v) Broccoli (vi) Green and Herbal Tea (vii) Flax seeds (viii) Black cohosh (ix) Turmeric.

4. Phytopharmaceuticals : Occurrence, isolation and characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of following – 12 Hrs

(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) Phenolicacids – Ellagic acid
(f) Vitamins
(g) Tocotrienols and Tocopherols
(h) Andrographolide, Glycolipids, Gugulipids,Withanolides, Vascine, Taxol
(i) Miscellaneous

5. Pharmacovigi1ance of drugs of natural origin: WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for bio drug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples. 12 Hrs

REFERENCES (Latest Editions of)

1. Pharmacognosy - G.E. Trease and W.C. Evans. Saunders Edinburgh, NewYork.
2. Pharmacognosy - Tyler, Brady, Robbers
3. Modem Methods of Plant Analysis – Peach & M.V. Tracey, Vol.I&II
4. Text Book of Pharmacognosy by T.E.Wallis S. Marine Natural Products - Vol. I to IV.
6. Natural products : A lab guide by Raphaellkan, Academic Press 1991.
7. Glimpses of Indian Ethano Pharmacology, P.Pushpangadam. UlfNyman. V.George Tropical Botanic Garden & Research Institute, 1995.
8. Medicinal natural products (a biosynthetic approach), Paul M. Dewick, John Wiley & Sons Ltd., England, 1998.
9. Chemistry of Marine Natural Products - Paulg. Schewer 1973.
10. Herbal Drug Industry by RD. Choudhary, Eastern Publisher, New Delhi, 1996.
11. Cultivation of Medicinal Plants by C.K.Atal & B.M. Kapoor.
12. Cultivation and Utilization of Aromatic Plants, C. K. Atal & B.M. Kapoor
13. Cultivation of medicinal and aromatic crops, A A Farooqui and B.S. Sreeramu University Press, 2001.

14. Natural Products from Plants, 1st edition, by Peter B.Kaufman, CRC Press, New York, 1998
15. Recent Advances in Phytochemistry - Vol.1 & 4 : Scikel Runeckles-Appleton Century crofts.
16. Textbook of Pharmacognosy, C.K. Kokate, Purohit, Ghokhale, Nirali Prakasshan, 1996.
17. Pharmacognosy and Pharmacobiotechnology, Ashutosh kar, NewAge Publications, New Delhi.

PHYTOCHEMISTRY

(R20_MPG103T)

SCOPE

Students shall be equipped with the knowledge of natural product drug discovery and will be able to isolate, identify and extract and the phyto- constituents

Objectives

After completion of course student is able to know about,

- different classes of phytoconstituents, their biosynthetic pathways, their properties, extraction and general process of natural product drug discovery
- phytochemical fingerprinting and structure elucidation of phytoconstituents.

THEORY 60 Hrs

1. Biosynthetic pathways and Radiotracing techniques : 12 Hrs

(i) 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,Vinca alkoloids.

(b) Glycosides : Digitoxin, Glycyrrhizin, Sennosides, Bacosides, Quercitin.

(c) Steroids : Hecogenin, guggulosterone and with anolides

(d) Coumarin : Umbelliferone.

(e) Terpenoids : Cucurbitacins

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 the following source : artemesin, andrographolides. Clinical studies emphasising on phases 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 HIS solvent for extraction, successive and exhaustive extraction and other methods of extraction commonly used like microwave assisted extraction, Methods of fractionation. Separation of phytoconstituents by latest CCCET SCFE techniques including preparative HPLC and Flash column chromatography. 12 Hrs

4. Phytochemical finger printing : HPTLC and LC MS/GC MS applications in the characterization of herbal extracts. Structure elucidation of phytoconstituents. 12 Hrs

5. Structure elucidation of the following compounds by spectroscopic techniques like UV, IR, MS, NMR (1H, 13C) 12 Hrs

(a) Carvone, Citral, Menthol
(b) Luteolin, Kaempferol
(c) Nicotine, Caffeine iv) Glycyrrhizin.

REFERENCES (Latest Editions of)

1. Organic chemistry by I.L. Finar Vol.II
2. Pharmacognosy by Trease and Evans, ELBS.
3. Pharmacognosy by Tylor and Brady.
4. Textbook 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 Seemi Siddiqui
10. Organic Chemistry of Natural Products,Vol.1&2. Gurdeep R Chatwal.
11. Chemistry of Natural Products - Vol.1onwards IWPAC.
12. Modem Methods of Plant Analysis – Peach & M.V.Tracey, Vol.I &II
13. Medicinal Natural products — a biosynthetic approach, Dewick PM, gohn Wiley & Sons, Toronto, 1998.
14. Chemistry of Natural Products, Bhat SV, Nagasampagi BA, Meenakshi S, Narosa Publishing House, NewDelhi.
15. Pharmacognosy & Phytochemistry of Medicinal Plants, 2nd edition, Brunetong, lnterceptt Ltd., New York,1999.

INDUSTRIAL PHARMACOGNOSTICAL TECHNOLOGY

(R20_MPG104T)

SCOPE

To understand the Industrial and commercial potential of drugs of natural origin, integrate traditional Indian systems of medicine with modern medicine and also to know regulatory and quality policy for the trade of herbals and drugs of natural origin.

Objectives

After completion of course student is able to know about,

- the requirements for setting up the herbal/natural drug industry.
- the guidelines for quality of herbal/natural medicines and regulatory issues.
- the patenting/IPR of herbals/natural drugs and trade of raw and finished materials.

THEORY 60 Hrs

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 and production management of herbals. 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. Quality assurance in herbal/natural drug products. Concepts of TQM, GMP, GLP, ISO-9000. 12 Hrs

3. Monographs of herbal drugs : General parameters of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic Pharmacopoeia, Siddha and Unani Pharmacopoeia, American herbal pharmacopoeia, British herbal pharmacopoeia, WHO guidelines in quality assessment of herbal drugs. 12 Hrs

4. Testing of natural products and drugs : Herbal medicines - clinical laboratory testing. 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 (Latest Editions of)

1. Herbal drug industry by R.D.Choudhary (1996), Eastern Publisher, New Delhi.
2. GMP for Botanicals – Regulatory and Quality issues on Phytomedicine by Pulok K Mukharjee (2003), lst Edition, Business horizons Robert Verpoorte, New Delhi.
3. Quality control ofherbal drugs by Pulok K Mukarjee (2002), Business Horizons Pharmaceutical Publisher, NewDelhi.
4. PDR for Herbal Medicines (2000), Medicinal Economic Company, New jersey.
5. Indian Herbal Pharmacopoeia (2002), IDMA, Mumbai.
6. Textbook of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (1996), Nirali Prakashan, New Delhi.
7. Textbook of Pharmacognosy and Phytochemistry by Vinod D. Rangarl (2002), Part I & II, Career Publication, Nasik, India.
8. Plant drug analysis by H. Wagner and S. Bladt, Springer, Berlin.
9. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V.Rajpal (2004), Vol.I, Eastern Publisher, New Delhi.
10. Phytochemical Dictionary Handbook of Bioactive Compounds from Plants by J.B. Harborne, (1999), llnd Edition, Taylor and Francis Ltd, UK.
11.Herbal Medicine. Expanded Commission E Monographs by M. Blumenthal, (2004), IST Edition,
12. Drug Formulation Manual by D.P.S. Kohli and D.H. Shah (1998), Eastern Publisher, New Delhi.

PHARMACOGNOSY PRACTICAL – I

(R20_MPG105P)

1. Analysis of Pharmacopoeial compounds of natural origin and their formulations by UV Vis spectrophotometer
2. Analysis of recorded spectra of simple phytoconstituents
3. Experiments based on Gas Chromatography
4. Estimation of sodium/potassium by flame photometry
5. Development of fingerprint of selected medicinal plant extracts commonly used in herbal drug industry viz. Ashwagandha, Tulsi, Bael, Amla, Ginger, Aloe, Vidang, Senna, Lawsonia by TLC/HPTLC method.
6. Methods of extraction
7. Phytochemical screening
8. Demonstration of HPLC-estimation of glycerrhizin
9. Monograph analysis of clove oil
10. Monograph analysis of castor oil.
11. Identification of bioactive constituents from plant extracts
12. Formulation of different dosage forms and their standardisation.

SYLLABUS

Semester II

PHARMACOGNOSY

2ND SEMESTER

MEDICINAL PLANT BIOTECHNOLOGY

(R20_MPG201T)

SCOPE

To explore the knowledge of Biotechnology and its application in the improvement of quality of medicinal plants

Objectives

After completion of course student is able to know about,

- Know the process like genetic engineering in medicinal plants for higher yield of Phytopharmaceuticals.
- Use the biotechnological techniques for obtaining and improving the quality of natural products/medicinal plants

THEORY 60 Hrs

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. Micropropagation 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: lmmobilization techniques of plant cell and its applicationon 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 12 Hrs

medicinal agents. Precursors and elicitors on production of secondary metabolites.

4. Biotransrormation 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 Fermentations technology, Production of ergot alkaloids, single cell proteins, enzymes of pharmaceutical interest. 12 Hrs

REFERENCES (Latest Editions of)

1. Plant tissue culture, Bhagwani, vol5, Elsevier Publishers.
2. Plant cell and Tissue Culture (Lab.Manual), JRMM.Yeoman.
3. Elements in biotechnology by P K.Gupta, Rastogi Publications, New Delhi.
4. An introduction to plant tissue culture by M K.Razdan, Science Publishers.
5. Experiments in plant tissue culture by John HD and Lorin WR., Cambridge University Press.
6. Pharmaceutical biotechnology by S P.Vyasand VK.Dixit, CBS Publishers.
7. Plant cell and tissue culture by Jeffrey W. Pollard and John M Walker, Humana press.
8. Plant tissue culture by Dixon, Oxford Press, Washington DC, 1985
9. Plant tissue culture by Street.
10. Pharmacognosy by G.E.Trease and WC. Evans, Elsevier.
11. Biotechnology by Purohit and Mathur, Agro-Bio, 3rd revised edition.
12. Biotechnological applications to tissue culture by Shargool, Peter D, Shargoal, CKC Press.
13. Pharmacognosy by Varo E.Tyler, Lynn R. Brady and James E. Robberrt, That Tjen,NGO.
14. Plant Biotechnology, Ciddi Veerasham.

ADVANCED PHARMACOGNOSY – II

(R20_MPG202T)

SCOPE

To know and understand the Adulteration and Deterioration that occurs in herbal/natural drugs and methods of detection of the same. Study of herbal remedies and their validations, including methods of screening

Objectives

After completion of course student is able to know about,

- validation of herbal remedies
- methods of detection of adulteration and evaluation techniques for the herbal drugs
- methods of screening of herbals for various biological properties

THEORY 60 Hrs

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, detection of heavy metals, pesticide residues, phytotoxin, microbial contamination in herbs and their formulations. 12 Hrs

3. Ethnobotany and Ethnopharmaco1ogy: Ethnobotany in herbal drug evaluation, Impact of Ethnobotany in traditional medicine, New development in herbals, Bio-prospecting 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. Bio1ogica1 screening of herbal drugs : Introduction and Need for Phyto-Pharmacological Screening, New Strategies for evaluating Natural Products, In 12 Hrs

vitro evaluation techniques for Antioxidants, Antimicrobial and Anticancer drugs. In vivo evaluation techniques for Anti-inflammatory, Antiulcer, Anticancer, Wound healing, Antidiabetic, Hepatoprotective, Cardioprotective, Diuretics and Anti fertility, Toxicity studies as per OECD guidelines

REFERENCES (Latest Editions of)

1.Glimpses of Indian EthanoPharmacology by P.Pushpangadam. Ulf Nyman. V. George Tropical Botanic Garden & Research Institute.
2. Natural products: A lab guide by Raphael lkan, Academic Press.
3. Pharmacognosy - G. E. Trease and W.C. Evans. WB Saunders Edinburgh, New York.
4. Pharmacognosy - Tyler, Brady, Robbers, Lee & Fetiger.
5. Modem Methods of Plant Analysis – Peach & M.V. Tracey, Vol. I & II, Springer Publishers.
6. Herbal Drug Industry by R D. Choudhary, Eastern Publishers, New Delhi.
7.Textbook of Pharmacognosy by C.K. Kokate, Purohit, Ghokhale, Nirali Prakashan.
8. Text Book of Pharmacognosy by T.E. Wallis, J & A Churchill Ltd., London.
9. Quality control of herbal drugs by Pulok K Mukherjee, Business Horizons Pharmaceutical Publishers, New Delhi.
10. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
11. Text book of Pharmacognosy and Phytochemistry by Vinod D. Rangarl, Part I & II, Career Publication, Nasik, India.
12. Plant drug analysis by H.Wagner and S.Bldt, 2nd edition, Springer, Berlin.
13. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol. I, Eastern Publishers, New Delhi.
14. Herbal Medicine. Expanded Commission E Monographs, M. Blumenthal.

INDIAN SYSTEMS OF MEDICINE - THEORY

(R20_MPG203T)

SCOPE

To make the students understand thoroughly the principles, preparations of medicines of various Indian systems of medicine like Ayurveda, Siddha, Homeopathy and Unani. Also focusing on clinical research of traditional medicines, quality assurance and challenges in monitoring the safety of herbal medicines.

Objectives

After completion of the course, student is able to

- To understand the basic principles of various Indian systems of medicine
- To know the clinical research of traditional medicines, Current Good Manufacturing Practice of Indian systems of medicine and their formulations.

THEORY 60 Hrs

1. Fundamental concepts of Ayurveda, Siddha, Unani and Homoeopathy systems of medicine 12 Hrs

Different dosage forms of the ISM.

(a) Ayurveda: Ayurvedic Pharmacopoeia, Analysis of formulations and bio crude drugs with references to : Identity, purity and quality.

(b) Siddha : Gunapadam (Siddha Pharmacology), raw drugs/Dhatu/geevam in Siddha system of medicine, Purification process (Suddhi).

2. Naturopathy, Yoga and Aroma therapy practices 12 Hrs

(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.

3. Formulation development of various systems of medicine 12 Hrs

(a) 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.

(b) Standardization, Shelf life and Stability studies of ISM formulations.

4. Schedule T — 12 Hrs

(a) Good Manufacturing Practice of Indian systems of Medicine

(b) 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.
(c) Quality assurance in ISM formulation industry - GAP, GMP and GLP. (d)
(d) Preparation of documents for new drug application and export registration.
(e) Challenges in monitoring the safety of herbal medicines: Regulation, quality assurance and control, National/Regional Pharmacopoeias.

5. TKDL, Geographical indication Bill, Government bills in AYUSH, ISM, CCRAS, CCRS, CCRH, CCRU — 12 Hrs

REFERENCES (Latest Editions of)

1. Ayurvedic Pharmacopoeia, The Controller of Publications, Civil Lines, Govt. of India, New Delhi.
2. Hand Book on Ayurvedic Medicines, H.Panda, National Institute of Industrial Research, New Delhi.
3.Ayurvedic System of Medicine, Kaviraj Nagendranath Sengupata, Sri Satguru Publications, NewDelhi.
4. Ayurvedic Pharmacopoeia. Formulary of Ayurvedic Medicines, IMCOPS, Chennai.
5. Homeopathic Pharmacopoeia. Formulary of Homeopathic Medicines, IMCOPS, Chennai.
6. Homeopathic Pharmacy : An introduction & Handbook, Steven B. Kayne, Churchill Livingstone, New York.
7. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
8. British Herbal Pharmacopoeia, British Herbal Medicine Association, UK.
9. GMP for Botanicals – Regulatory and Quality issues on Phytomedicine, Pulok K Mukharjee, Business Horizons, New Delhi.
10. Indian System of Medicine and Homeopathy in India, Planning and Evaluation Cell, Govt. of India, New Delhi.
11. Essential of Food and Nutrition, Swaminathan, Bappco, Bangalore.
12. Clinical Dietitics and Nutrition, F.P.Antia, Oxford University Press,Delhi.
13. Yoga – The Science of Holistic Living by V.K.Yoga,VivekanandaYoga Prakashna Publishing, Bangalore.

HERBAL COSMETICS

(R20_MPG204T)

SCOPE

This subject deals with the study of preparation and standardization of herbal/natural cosmetics. This subject gives emphasis to various national and international standards prescribed regarding herbal cosmeceuticals.

Objectives

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

- understand the basic principles of various herbal/natural cosmetic preparations
- current Good Manufacturing Practices of herbal/natural cosmetics as per the regulatory authorities

THEORY 60 Hrs

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. Commonly used herbal cosmetics, raw materials, preservatives, surfactants, humectants, oils, colors, and some functional herbs, pre formulation studies, compatibility studies, possible interactions between chemicals and herbs, design of herbal cosmetic formulation. 12 Hrs

3. Herbal Cosmetics : Physiology and chemistry of skin and pigmentation, hairs, scalp, lips and nail, Cleansing cream, Lotions, Face powders, Face packs, Lipsticks, Bath products, soaps and baby product, 12 Hrs
Preparation and standardization of the following:
(a) Tonic (b) Bleaches (c) Dentifrices (d) Mouth washes (e) Tooth Pastes
(f) Cosmetics for Nails.

4. Cosmeceuticals of herbal and natural origin: Hair growth formulations, Shampoos, Conditioners, Colorants & hair oils, Fairness formulations, vanishing & foundation creams, anti-sun burn preparations, moisturizing creams, deodorants. 12 Hrs

5. Analysis of Cosmetics, Toxicity screening and test methods : 12 Hrs
Quality control and toxicity studies as per Drug and Cosmetics Act

REFERENCES (Latest Editions of)

1. Panda H. Herbal Cosmetics (Handbook), Asia Pacific Business Press Inc, New Delhi.
2. Thomson EG. Modern Cosmetics, Universal Publishing Corporation, Mumbai.
3. P.P. Sharma. Cosmetics - Formulation, Manufacturing & Quality Control, Vandana Publications, New Delhi.
4. Supriya KB. Handbook of Aromatic Plants, Pointer Publishers, Jaipur.
5. Skaria P. Aromatic Plants (Horticulture Science Series), New India Publishing Agency, New Delhi.
6. Kathi Keville and Mindy Green. Aroma theraphy (A Complete Guide to the Healing Art), Sri Satguru Publications, New Delhi.
7. Chattopadhyay PK. Herbal Cosmetics & Ayurvedic Medicines (EOU), National Institute of Industrial Research, Delhi.
8. Balsam MS &Edward Sagarin.Cosmetics Science and Technology, Wiley Interscience, NewYork

PHARMACOGNOSY PRACTICAL – I

(R20_MPG205P)

1. Isolation of nucleic acid from cauli flower heads
2. Isolation of RNA from yeast
3. Quantitative estimation of DNA
4. Immobilization technique
5. Establishment of callus culture
6. Establishment of suspension culture
7. Estimation of aldehyde contents of volatile oils
8. Estimation of total phenolic content in herbal raw materials
9. Estimation of total alkaloid content in herbal raw materials
10. Estimation of total 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 Aroma therapy formulations
13. Preparation of herbal cosmetic formulation such as lipbalm, lipstick, facial cream, herbal hair and nail care products
14. Evaluation of herbal tablets and capsules
15. Preparation of sunscreen, UV protection cream, skin care formulations.
16. Formulation & standardization of herbal cough syrup.

SYLLABUS

Semester III

PHARMACOGNOSY

3RD SEMESTER

RESEARCH METHODOLOGY& BIOSTATISTICS

(R20_MPT384T)

UNIT–I

General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, cross over design, placebo, blinding techniques.

UNIT–II

Biostatistics : Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests (students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxan rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.

UNIT–III

Medical Research : History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.

UNIT–IV

CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal

hygiene, location of animal facilities to laboratories, anesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.

UNIT–V

Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care.