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GPRCP-EXT/MPS/9-10/PCG/00

Scheme of Instruction and Evaluation for M. Pharmacy
(Pharmacognosy)

I – Semester

Subject Code	Subject / Paper	Theory / Practical	Instruction Hours per week		Evaluation		Duration of External Examination
			Theory	practical	Internal	External	
M PCG.T.1.101	Pharmaceutical Analytical Techniques	Theory	4	–	30	70	3
M PCG.T.1.102	Advanced Pharmacognosy – I	Theory	4	–	30	70	3
M PCG.T.1.103	Medicinal Plant Biotechnology	Theory	4	–	30	70	3
M PCG.T.1.104	Advanced Chemistry of Natural Products	Theory	4	–	30	70	3
M PCG.P.1.105	Pharmaceutical Analytical Techniques	Practical	–	6	30	70	6
M PCG.P.1.106	Advanced Chemistry of Natural Products	Practical	–	6	30	70	6
M PCG.T.1.107	Entrepreneurship Management (SAIL)	Tutorials	2	–	A/B/C/D	–	–
M PCG.1.108	Seminar	–	–	8	50		
			18	20	230	420	

Scheme of Instruction and Evaluation for M. Pharmacy
(Pharmacognosy)
II– Semester

Subject Code	Subject / Paper	Theory / Practical	Instruction Hours per week		Evaluation	Duration of External Examination		
			Theroy	Practical	Theory	Practical	Internal	External
M PCG.T.1.201	Intellectual Property Rights & Regulatory Affairs	Theory	4	–	30	70		3
M PCG.T.1	Advanced Pharmacog	Theory	4	–	30	70		3

.202	nosy– II						
M PCG.T.1 .203	Herbal Drug Developme nt& Standardiz ation	Theor y	4	–	30	70	3
M PCG.T.1 .204	Nutraceutic als	Theor y	4	–	30	70	3
M PCG.P.1 .205	Advanced Pharmacog nosy– II	Practi cal	–	6	30	70	6
M PCG.P.1 .206	Herbal Drug Developme nt& Standardiz ation	Practi cal	–	6	30	70	6
M PCG.T.1 .207	Scientific and Technical Writing (SAIL)	Tutori als	2	–	A/B/C/D	–	–
M PCG.T.1 .208	Seminars	–	–	8	50	–	–
			18	20	230	420	

SAIL: Self assess Instrumentation Learning

Scheme of Instruction and Evaluation for M. Pharmacy
(Pharmacognosy)
Semester III and IV

DISSERTATION – Original research work carried out by the candidate under the guidance of regular teaching faculty/visiting faculty of the department should be submitted in a bound form.
Evaluation of the dissertation shall be done by external and internal examiners appointed by the university.
Dissertation viva-voce Grade A/B/C/D/F
Dissertation report Grade A/B/C/D/F
A: Excellent B. Very good C. Good D: Fair F. Fail

PHARMACEUTICAL ANALYTICAL TECHNIQUES

M PCH.T.1.101 | **Period/Week: 4**
Sessional: 30 | **Duration of Exam: 3 hrs**
Examination: 70 | **Nature of Exam: Theory**

UNIT – I

a) UV-Visible Spectroscopy: Basic principles, interaction of electromagnetic radiation with matter and its effects (electronic transitions). Concept of chromophore and auxochrome, effect of conjugation, solvent and pH. Instrumentation (components and their significance). Absorption spectra of organic compounds and complexes illustrating the phenomenon and its utilization in qualitative and quantitative studies of drugs including multicomponent analysis. Woodward-Fieser rules for caculating absortion maximum for unsaturated hydrocarbons. Difference and derivative spectra.

b) Infra-Red Spectroscopy: Interaction of infrared radiation with organic molecules and it's effects on bonds. Instrumentation- Dispersive IR spectrophotometers and Fourier transform spectrophotometers. Sample handling for IR spectroscopy. Interpretation of IR spectra. Brief note on ATR. (Attenuated Total Reflectance).

UNIT – II

Nuclear Magnetic Resonance Spectroscopy: Fundamental principles of NMR, instrumentation (components and their significance). Chemical shifts concept, spin- spin coupling, spin-spin decoupling, shielding and deshielding, solvents. signal multiplicity phenomena in high resolution PMR. Interpretation of PMR spectra.

Brief introduction about Carbon-13 NMR and 2D NMR Spectroscopy.

UNIT – III

Mass Spectrometry: Basic principles and instrumentation (components and their significance). Ionization techniques, mass spectrum and its characteristics, molecular ion, metastable ions, fragment ions; fragmentation processes, fragmentation patterns and fragment characteristics in relation to parent structure and functional groups. Relative abundances of isotopes and their contribution to characteristic peaks.

UNIT – IV

Chromatographic Techniques: Classification of chromatographic methods based on mechanism of separation and their basic principles. **Gas chromatography**: Instrumentation, column efficiency parameters, derivatisation methods, applications in pharmaceutical analysis. **Liquid chromatography**: Comparison of GC and HPLC, instrumentation in HPLC, normal and reversed phase packing materials, column selection, mobile phase selection, efficiency parameters, applications in pharmaceutical analysis. Instrumentation and applications of HPTLC, ion exchange chromatography, gel permeation chromatography, chiral chromatography, flash chromatography, and supercritical fluid chromatography (SFC).

UNIT – V

a) Electrophoresis: Principles, instrumentation and applications of moving boundary electrophoresis, zone electrophoresis (ZE), isotachphoresis, isoelectric focusing (IEF), continous electrophoresis (preparative) and capillary electrophoresis. SDS gel electrophoresis and blotting techniques.

b) Radio immunoassay and ELISA: Principle, instrumentation, applications and limitations.

Recommended Books:

1. Skoog, DA, Holler, FJ, Crouch, SR. Principles of instrumental analysis. 6th ed., Baba Barkha Nath printers, Haryana, 2007.

2. Silverstein, RM, Webstar, FX. Spectrometric identification of organic compounds. 6th ed., John Wiley & Sons (Asia) Pvt. Ltd., Singapore, 2005.

3. William Kemp. Organic spectroscopy, 3rd ed., Palgrave, New York, 2006.

4. Jag Mohan, Organic spectroscopy: Principles and Applications, 2nd ed., Narosa publishing house Pvt Ltd., New Delhi, 2005.

5. Conners KA. A Text book of pharmaceutical analysis, 3rd ed., John Wiley & Sons, Singapore, 2004.

6. Willard HH, Merritt LL, Dean JA, Settle FA. Instrumental methods of analysis, 7th ed., CBS Publishers & Distributors, New Delhi, 1986.

7. Pavia DL, Lampman GM, Kriz GS, Vyvyan JA. Introduction to spectroscopy. 4th ed., Brookescole publishers, California, 2008.

8. Sharma BK. Instrumental methods of chemical analysis, 25th Ed., Goel Publishing house, Meerut, 2006.

9. Beckett, AH, Stenlake, JB. Practical pharmaceutical chemistry, Part I & II, 4th ed., CBS Publishers & distributors, New Delhi, 2004.

10. Ewing, GW. Instrumental methods of chemical analysis, 5th ed., McGraw Hill Book Company, New York, 1985.

11. Schirmer, RE. Modem methods of pharmaceutical analysis, Vol. I & II, 2nd ed., CRC Press, Florida, 2000.

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ADVANCED PHARMACOGNOSY – I

Subject Code: M.PCG T 1.102 **Sessional : 30**

Periods/week: 4 **Examination : 70**

Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit –I:

General introduction to the importance of Pharmacognosy in herbal drug industry. Present status and future prospects of Medicinal plants. General aspects of Propagation methods, Harvesting, Drying and Processing methods. Packing and storage of Herbal drugs. Weed management and control. Pest control and study of pesticides with special importance to natural pesticides.

Unit – II

Systematic study of medicinal plants cultivated in India with reference to cultivation, constituents and uses of Senna, Clove, Opium, Ispaghula, *Commiphora mukul*, Ashwagandha, Lemongrass, Turmeric, Pepper.

Unit – III

Principles of Ayurvedic systems of medicines, their merits and demerits. Introduction to different dosage forms. Preparation Methods of Ayurvedic medicines. Approximate equivalents of doses in Indian and Metric system, English equivalents of Ayurvedic clinical conditions and diseases.

Unit – IV

Principles of homeopathy and Unani systems of medicines, their merits and demerits. Introduction to different dosage forms and methods of preparation of Homeopathy and Unani medicines.

Unit – V

Study of information retrieval methods of natural plants and herbal data base. Phytochemical and Pharmacological literature review of Acorus calamus, *Momordica charantia, Tinospora cardifolia, Ocimum sanctum, Allium sativum, Phyllanthus emblica, Ammi majus.*

Recommended Books :

1. Cultivation of Medicinal Plants by CK Atal and BM Kapoor.
2. Cultivation and Utilization of aromatic plants by CK Atal and BM Kapoor.
3. Ayurvedic formulary of India, Govt. of India.

4. Homeopathic Pharmacopoeia
5. Unani Medical Systems
6. Bibiliography of Pharmacognosy of Medicinal Plants by Mitra Roma, ELBS Edn.
7. Indian meidicinal Plants by Kirthikar, Basu.Indian
8. Materia Medica by K.M. Nadkarni
9. Herbal Harvest, Greg Whitten, CBS Publications.
10. Cultivation of Medicinal and Aromatic Crops by AA Farooqi and BS Sreeramu, Universities Press.

Reference Books :

1. Plant propagation – principle & practices by hertamann Kester.
2. Pharmacopoeial Standards for Ayurvedic formulations – CCRAS, Delhi.
3. Selected topics in Experimental Pharmacology – VK Seth
4. The use of Pharmacological techniques for the evaluation of natural products by BN Chavan and RC Srimal (CDRI).

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MEDICINAL PLANT BIOTECHNOLOGY

Subject Code: M.PCG T 1.103 **Sessional: 30**

Periods/week: 4 **Examination : 70**

Nature of Exam : Theory **Exam Duration: 3 Hrs**

Unit – I

Introduction to Genetics & Melecular Biology: Structural, Molecular & Chromosomal organization of cell, cellcycle, mitosis and meiosis, genetic code.

Plant genetics: Reproduction in plants, Variation in plants, Heritability and Basis of plant breeding.

Unit – II

Gene transfer in plants: Using vectors of Agrobacterium, Ti, Ri, DNA mediated gene transfer techniques electroporation, microprojection, micro & macroinjection, liposomes, ultrasonication and localization of transferred gene in genetically modified plants.

(a) Use of markers (b) DNA hybidisation

Unit – III

Crop quality improving methods: Chemodemes, Hybrization, Mutation & Polyploidy. Applications of transgenic plants: Resistance to physiological stress, insects, fungus, virus and herbicides, Production of Phytopharmaceuticals and edible vaccines.

Unit – IV

Tissue culture: Laboratory organisation, Media, Aseptic Manipulation.

Culture methods: Organogenesis, Embryogenesis, Micro propogation, Somaclonal variation. Haploid culture and Synthelic seeds.

Immobilization Methods.

Unit – V

Strategies for Production of secondary metabolites: Biotransformation - Use of precursors, Growth regulators and elicitors,

Methods: Batch culture, Continuous culture, Hairy root culture and their applications.

Production of important secondary metabolites, Ex: Ajmalicine, Shikonin, Artemicinin, and Rosmaric acid.

Recommended Books:

1. Introduction to plant tissue culture by M.K. Razadam
2. Molecular biology & Biotechnology by J.M. Walker & E.D. Gingo
3. Advanced methods in plant breeding & biotiechnology by David R Mirray
4. Experiments in plant tissue culture by John, H.D. & Lorin W.R.

5. Plant cell & tissue culture by Jafferey. W. Pollard & John. M. Walker

Reference Books :

1. Essentials of Molecular biology by Dovid. F.A. George. M.M.
2. Breeding field crops by John M.P. & David. A.S.
3. Pharmaceuticals Biotiechnology S.P. Vyas & V.K. Dixit
4. Biotechnology theory & technique vol I by Jack. G. C.
5. Pharmacognosy by G.E. Trease & W.C.Evans ELBS.
6. Biotechnology by purohit & Matherr
7. Comprehensive biotechnology by Mooyoung
8. Biotechnology application to tissue culture by Shargool.
9. Plant tissue culture by Dixon
10. Plant tissue culture by Street
11. Elements of Biotechnology by P.K. Gupta.

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ADVANCED CHEMISTRY OF NATURAL PRODUCTS

M PCG.T.1.104 | **Period/Week: 4**
Sessional: 30 | **Duration of Exam: 3 hrs**
Examination: 70 | **Nature of Exam: Theory**

UNIT – I

Natural products as leads for new drugs: Introduction/history, approaches to discovery and development of natural products as potential new drugs selection and optimization of lead compounds for further development with suitable examples from antibiotics, CNS, and cardiovascular agents.

UNIT – II

Alkaloids: Introduction and general methods of structure elucidation.
From opium: morphine-structural elucidation, development of morphine analogues and morphine antagonists.
From Rauwolfia: Reserpine-structural eludication, structural modifications and uses.
From vinca rosea: vincristine and vinblastine - structural modification, semi synthetic derivatives, and uses.

UNIT – III

Steroids: Introduction, nomenclature, stereochemistry of steroids. Source and structure elucidation of cholesterol and diosgenin.
Structures, structural modifications and therapeutic uses of steroidal anti-inflammatory agents and antifertility agents.

UNIT – IV

Polypeptides and proteins: introduction and general methods of separation, general methods of degradation and end group analysis, general methods of synthesis of peptides. Primary, secondary, tertiary and quaternary structure of proteins; chemistry of insulin.

UNIT – V

Miscellaneous compounds: Structure, structural modifications, mechanism of action and therapeutic uses of a) taxanes b) camptothecin c) artemisicin e) ginkolides and f) gymnemic acids.

Recommended Books:

1. Finar IL. Organic Chemistry-stereochemistry and the chemistry of natural products. 5th ed. vol 2. Delhi: Dorling Kindersley (India) Pvt. Ltd., 2006.
2. Morrison RT, Boyd RN. Organic Chemistry. 6th ed. Delhi: Pearson education Pvt. Ltd., 2003.
3. Pelletier SW. Alkaloids-chemical & biological perspectives. vol 1-15. London: Pergamon; 2001.
4. Steroids by Fischer & Fischer.
5. Evans WC. Trease and evans pharmacognosy. 15th ed. Edinburgh: Saunders. 2004.
6. Ataur Rahman. Chemistry of natural products
7. Bhat SV, Nagasampagi BA, Sivakumar M. Chemistry of natural products. New Delhi: Narosa Publishing House; 2005.
8. Agrawal OP. Organic chemistry-natural products. 30th ed. vol 1-2. Meerut: Goel Publishing House; 2006.
9. Wallis TE. Textbook of pharmacognosy. 5th ed. New Delhi: CBS Publishers & Distributors; 2002.
10. Abraham DJ, editor. Burger's medicinal chemistry and drug discovery. 6th ed. vol 1-6, Singapore: John Wiley & Sons, 2007.
11. Lemke TL, Williams DA, Roche VF, Zito SW. Foye's principles of medicinal chemistry. 6th

ed. New Delhi: Wolters Kluwer/ Lippincott Williams & Wilkins. 2008.
12. Block JH, Beale JM, editor. Wilson and gisvold's textbook of organic medicinal and pharmaceutical chemistry. 11th ed. Baltimore: Lippincott Williams & Wilkins; 2004.
13. Jerry M. Advanced organic chemistry-reactions, mechanisms, and structure. 4th ed. Kundli: Replika Press Pvt. Ltd; 2003.
14. Murray RK, Granner DK, Mayes PA, Rodwell VW. Harper's Illustrated biochemistry. 26th ed. New Delhi: Mc Graw Hill, 2003.
15. Rama Rao AVSS. A text book of biochemistry. 9th ed. Delhi: Rajkamal electric press, 2004.
16. Remington: The science and practice of pharmacy. 21st ed., vol. I & II, Lippincatt Willams & Wilkings, New Delhi, 2005.

PHARMACEUTICAL ANALYTICAL TECHNIQUES

M PCG.P.1.105 **Period/Week: 6**
Sessional: 30 **Duration of Exam: 6 hrs**
Examination: 70 **Nature of Exam: Practical**

List of Experiments: (Minimum of 8 experiments shall be conducted)

1. UV/Visible spectrum scanning of a few organic compounds for UV- absorption and correlations of structures (5 compounds) and isosbestic point in case of mixtures.
2. Effect of solvents and pH on UV spectrum of drugs. (2 experiments)
3. Estimation of multicomponent formulation by UV- Spectrophotometer in formulations. (2 experiments)
4. Experiments based on the application of derivative spectroscopy. (2 experiments)
5. Experiments based on HPLC (Isocratic and Gradient elution) techniques. (2 experiments)
6. Interpretation of drugs by IR spectra.
7. Workshop of spectroscopy: (UV, IR, NMR, MASS) structural elucidation of at least 5 compounds. (4 experiments)
8. Any other relevant experiments based on theory.

ADVANCED CHEMISTRY OF NATURAL PRODUCTS

M PCG.P.1.106 **Period/Week: 6**
Sessional: 30 **Duration of Exam: 6 hrs**
Examination: 70 **Nature of Exam: Practical**

List of Experiments: (Minimum of 8 experiments shall be conducted)

1. Isolation and characterization of the following natural products:
   a. Piperine from black pepper
   b. Hesperidin from orange peel.
   c. Strychnine from Nux vomica seeds.
   d. Curcumin from turmeric powder.
   e. Lycopene from tomatoes.
   f. Myristicin and trimyristicin from nutmeg.
   g. Tannic acid from myrobalan.
   h. Isolation of casein from milk.
   i. Lysozyme from albumen.

2. Extraction and estimation of carvone from caraway seeds. 3. Separation of natural products

through column chromatography. 4. Degradation and characterization of degradation products of a) Piperine b) Atropine and c) Caffeine. 5. Any other relevant experiments based on theory.

References:

1. Raphel I. Natural products: a laboratory guide. 2nd ed. New Delhi: Elsevier, 2005.
2. Kokate CK. Practical pharmacognosy. New Delhi: Vallabh Prakashan.
3. Khandelwal KR. Practical pharmacognosy. Pune: Nirali Prakashan.
4. Rangari VD. Pharmacognosy & phytochemistry. Part II. Nashik: Career Publications; 2004.
5. Qadry JS. Shah and Qadry's pharmacognosy. 12th ed. Ahmedabad: B. S. Shah Prakashan; 2005.

ENTREPRENEURSHIP MANAGEMENT

Subject Code : M.PCG. T 1.107 Sessional : 50
Periods/week : 2 Examination : --
Nature of Exam: Tutorials Exam Duration: --

Course Objectives:

- To provide conceptual inputs regarding entrepreneurship management.
- To sensitize and motivate the students towards entrepreneurship management.
- To orient and impart knowledge towards identifying and implementing entrepreneurship opportunities.
- To develop management skills for entrepreneurship management.

UNIT – I: CONCEPTUAL FRAME WORK

- Concept need and process in entrepreneurship development.
- Role of enterprise in national and global economy
- Types of enterprise – Merits and Demerits
- Government policies and schemes for enterprise development
- Institutional support in enterprise development and management

UNIT – II: THE ENTREPRENEUR

- Entrepreneurial motivation – dynamics of motivation.
- Entrepreneurial competency – Concepts.
- Developing Entrepreneurial competencies - requirements and understanding the process of entrepreneurship development, self awareness, interpersonal skills, creativity, assertiveness, achievement, factors affecting entrepreneur'' role.

UNIT – III: LAUNCHING AND ORGANISING AN ENTERPRISE

- Environment scanning – Information, sources, schemes of assistance, problems.
- Enterprise selection, market assessment, enterprise feasibility study, SWOT Analysis.
- Resource mobilization - finance, technology, raw material, site and manpower.
- Costing and marketing management and quality control.
- Feedback, monitoring and evaluation.

UNIT – IV: GROWTH STRATEGIES AND NETWORKING

- Performance appraisal and assessment
- Profitability and control measures, demands and challenges
- Need for diversification
- Future Growth – Techniques of expansion and diversification, vision strategies
- Concept and dynamics
- Methods, Joint venture, co-ordination and feasibility study

UNIT – V: PREPARING PROJECT PROPOSAL TO START ON NEW ENTERPRISE

- Project work – Feasibility report; Planning, resource mobilization and implementation.

Reference

1. Akhauri, M.M.P.(1990): Entrepreneurship for Women in India, NIESBUD, New Delhi.
2. Hisrich, R.D & Brush, C.G.(1996) The Women Entrepreneurs, D.C. Health & Co., Toranto.
3. Hisrich, R.D. and Peters, M.P. (1995): Entrepreneurship – Starting, Developing and Managing a New Enterprise, Richard D., Inwin, INC, USA.
4. Meredith, G.G. etal (1982): Practice of Entrepreneurship, ILO, Geneva.
5. Patel, V.C.(1987): Women Entrepreneurship – Developing New Entrepreneurs, Ahmedabad EDII.

INTELLECTUAL PROPERTY RIGHTS AND REGULATORY AFFAIRS

M PCG.T.1.201 **Period/Week: 4**
Examination: 70 **Nature of Exam: Theory**
Sessional: 30 **Duration of Exam: 3 hrs**

UNIT – I

Patents and Intellectual Property Rights (IPR): definition, scope, objectives, source of patient information, patent processing and application. Patents, copyrights, trademarks, silent features, trade related aspects (TRIPS), international and regional agreements.

UNIT – II

GATT and WTO: GATT – historical, prospectives, objectives, fundamental principles, impact on developing countries. WTO-objectives, scope, functions, structure, status, membership and withdrawal, dispute settlement, impact on globalization, India-tasks & challenges.

UNIT – III

Regulatory Affairs: Indian context – requirements and guidelines of GMP, understanding of drugs and cosmetics act 1940 and rules 1945 with reference to schedule M, U and Y.

UNIT – IV

Related Quality Systems: Objectives and guidelines of USFDA, WHO and ICH. Introduction to ISO series.

UNIT – V

Documentation: Documentation types related to pharmaceutical industry, protocols, harmonizing formulation development for global filings, NDA, ANDA, CTD, dealing with post-approval changes – SUPAC, handling and maintenance including electronic documentation.

Recommended Books:

1. Guarino RA. New drug approval process, 4th ed., vol 139, Marcel Dekker Inc., New York, 2004.

2. Willing SH. Good manufacturing practices for pharmaceuticals. 5th ed., vol 109, Marcel Dekker Inc., New York, 2001.

3. Das P, Das G. Protection of industrial property rights.

4. Katju SN. Laws and drugs. Law Publishers.

5. Original Laws published by Government of India.

6. Hussain. Law of drugs in India.

7. Websites: www.fda.org ; www.wipo.int , www.ich.org , www.cder.org .

ADVANCED PHARMACOGNOSY – II

Subject Code: M.PCG T 1.202 **Sessional: 30**

Periods/week: 4 **Examination : 70**

Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit –I

General methods and Principles of extraction and their merits and demerits. Selection and purification of solvents for extraction. Identification of phytoconstituents.

Chromatography: Detailed study of TLC, Coloumn chromatography and high pressure thin layer chromatography and GLC.

Unit – II

Methods of investigation in Biogenetic studies. The investigation of biosynthetic pathways by isotopic tracer techniques. Detailed study of following Natural products with special importance to biosynthesis: Atropine, Reserpine, Terpenes and Ergometrin**.**

Unit –III

Terpenoids

Chemistry, classification and general methods of structural determination of Terpenoids.

Structure elucidation of camphor. Chemistry of Carvone, Eugenol and curcumin.

Carotenoids

Introduction, chemistry, classification nomenclature and properties of carotienoids. Structural elucidation of vitamin-A and β-Carotine Chemistry and sources of Lycopene and Bixin.

Unit – IV

Methods of isolation and estimation of the following phytoconstituents: Sennosides, Hesperidin, Caffeine, Emetine, Vasicine, Glycerhetinic acid, Capsaicn and curcumin.

Unit – V

Flavonoids

Introduction, classification, chemistry and properties of Flavonoids. Sources, structure and chemistry of quercetin, sylimarin and Rutin.

Sources, structures uses and chemistry of Podophyllotoxins, quinolin alkaloids, Degitalis glycosides and Withanolides.

Recommended Books:

1. Thin layer chromatography: Stahl.
2. Clarke's isolation & identification of drugs – AC Mottal
3. Phytochemical methods of chemical analysis by Harborne.
4. Plant phydiology by Frank B. Salisburry, Cleon, W.Ross, CBS, Delhi.
5. Phramcognosy by G.E. Trease, W.C. Evans, ELBS.
6. Pharmacognosy and pharmacobiotechnology by James E Robbers, Williams and Wilkins.

Reference Books:

1. Chromatography of Alkaloids by Varpoorte Swendson
2. Elements of chromatography by PK Lata.
3. Jenkins Quantitative pharmaceutical chemistry – AN Kenwell
4. Pharmacognosy by VE Tyler, LR Brady and JE Robbers (KM Varghese & Co., Bombay).
5. Text book of Pharmacognosy by T.E.Wallis, CBS, Delhi.
6. Practical Pharmacognosy: Kokate C.K., Vallabh prakashan, New Delhi.
7. Practical Pharmacognosy: Khandelwal K.R., Nirali Praksahan, Pune.
8. Introduction to Molecular Phytochemistry, C.H.J. Wells, Chapman & Hall
9. Modern methods of plant analysis – peach & M.V. Tracey. Vol.I to VII
10. Chemistry of Marine Natural Products by Paul J Schewer
11. Marine Phrmacognosy by Dean F. Martin & George Padilla.

HERBAL DRUG DEVELOPMENT AND STANDARDIZATION

Subject Code: M.PCG T 1.203 **Sessional : 30**

Periods/week: 4 **Examination: 70**

Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit – I

Herbal drug Industry: Study of infrastructure, staff requirement, project profiles, plant and equipment. Good laboratory practices. Regulatory requirement. Pilot scale up techniques.

Unit – II

Preparations and standardization of extracts of Garcinea, Andrographolides, Ginger, Forskolin, Aloes, Garlic and Arjuna.

a) Importance of standardization and WHO guide lines.

Unit – III

Priparation and standardization of Herbal formulations: Shampoos, Ointments, Face packs, tablets and capsules.

Unit-IV

Bio-statistics and design of experiments: Regression, tests of significance, F-test and analysis of variance : 1-way, 2-way classification, chi-square test.

Principles of randomization, replication and local control, completely randomized block of the above designs in pharmaceutical research. Bio assay-different types: dose effect relationships, calculation of LD50, ED50, probit analysis. Statistical

quality control, process control, control charts, acceptance sampling – sampling plans.

Unit- V

Screening of natural products for the following biological activities – analgesics, anti-inflammatory, antidiabetic, Immunomodulator, Hepatoprotecive, anti ulcers and antihypertensive

Recommended Books :

1. Vogel HG and Vogel WH, Drug discovery and evaluaion, pharmacological assays, springer – verlag.
2. Ayurvedic Pharmacopoeia
3. Thin layer chromatography by E. Stahi
4. Herbal Phamacopoeia
5. Herbal drugs industry by R.D. Chaudari.
6. SC Gupta and VK Kapoor, Fundamentals to applied statistics
7. Standardization of Botanicals by D. Rajpal, Eastern publishers.

Reference Books:

1. Alvin E. Lewis, Bio statistics
2. Homeopathic pharmacopoeia
3. Wealth of India CSIR, New Delhi.

NUTRACEUTICALS

Subject Code : M.PCG T 1.204 | **Sessional : 30**
Periods/week: 4 | **Examination : 70**
Nature of Exam: Theory | **Exam Duration: 3 Hrs**

Unit – I:

Overview- Relationship of Food, Nutrition, Health and Disease. Current status on Relationship of Nutrition and Health Dietary Guidelines / Food Guide Pyramid / Food vs. Drugs. Defining functional Foods, Nutraceuticals & Dietary Supplement, Special Dietary Foods & Infant formulas, Weight Control Products and Medical Foods.

Unit – II:

Source, Composition, and Functions of Vitamins and Minerals: Role of Vitamins and Minerals in Healing of Diseases and Health Promotion.

Source, Structure, and Functions of Phyto Nutrients: Plant sterols, Carotenoids, Isoflavones, Indoles and Thiols. Essential Fats and Oils: Omega-3-6-9 Fatty acids & Fat substitutes.

Unit – III:

Source, Structure and Functions of Natural Products: Hesperidin, L-Carnitine, Melatonin, Phosphatidyl Choline, Octacosanol, Glucosamine, Gallic Acid, Lipoic Acid.

Sources, Function and Relationship to Disorders of Health for Natural food Supplements: Bee Products (Pollen, Propolis & Honey), Fiber, Garlic, Ginseng, Lactobacillus Acidophilus & Bifidus.

Antioxidants and Phytochemicals and their Role in Prevention of Specific Diseases.

Unit – IV:

Food Laws and Regulations; FDA, FPO, MPO, BIS, AGMARK. HACCP and GMPs on Food Safety. Adultration of foods.

Regulations and Claims – Current Products: Label Claims, Nutrient Content Claims, Health Claims, Dietary Supplements Claims;

Unit – V:

Food Pharmacy: Health Problems and Diseases that can be prevented or cured by Foods- Atherosclerosis, Arthritis, Asthma, Cancer, Constipation, Diabetes, Diarrhea, High Blood pressure, Stroke, Ulcer and Urinary Tract Problems using appropriate Spices, Fruits, Vegetables, Cereals, Grains, Pulses, Oils, Milk, Meat et

Recommended Books:

1. Advanced Nutritional Therapies by Cooper. K.A., (1996).
2. Vitamin Bible for the 21st Century by Mindel E (2001).
3. Secrets of Long Life by Walker Morton., devin-Auker Publications, NY (1993).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2nd Edn., Avery Publishing Group, NY (1997).

Reference Books:

1. Barrett, S. and Herbert, V. 1994. *The Vitamin Pushers*. Prometheus Books Amherst, NY.
2. Barett, S. and Jarvis, W.T. 1993. *The Health Robbers*. Prometheus Books, Amherst, NY.
3. Bauernfeind, J.C. and Paul A. LaChance 1991. *Nutrient Additions to Food.* Food & Nutrition Press, Inc. Trumbull, Connecticut.
4. G. Gibson and C.williams Editors *2000 Functional foods* Woodhead Publ.Co.London.
5. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
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CONTROLLED DOCUMENT

GPRCP-EXT/MPS/9-10/PCG/00

ADVANCED PHARMACOGNOSY PRACTICALS

Subject Code: M.PCG P.1.205 **Sessional: 30**

Periods/Week: 6 **Examination: 70**

Nature of Examination: Practicals **Exam Duration: 6Hrs**

List of experiments

Minimum 8 experiments shall be conducted.

1. Isolation and purification of Diosgenin from Dioscorea.
2. Isolation and purification of Berberine from Berberis roots.
3. Isolation and purification of quinine from Cinchona bark.
4. Isolation and purification of Sennosides from Senna.
5. Isolation of pectin from Orange peel.
6. Isolation of Nicotine as Nictine picrate from Tobbaco.
7. TLC studies of phytoconstituents.
8. Extraction and phytochemical screening
9. Isolation of Bixin from Bixa seeds.
10. Isolation and purification of Vasicine from Vasaka leaves.
11. Prepartion of Ammonium Glycyrrhizinate from Liquorice.
12. Isolation and purification of Stigmasterol from Soyabean oil.

Any related experiments based on Theory.

HERBAL DRUG DEVELOPMENT AND STANDARDIZATION PRACTICALS

Subject Code: M.PCG P 1.206 **Sessional : 30**

Periods/week: 6 **Examination: 70**

Nature of Exam: Practicals **Exam Duration: 6 Hrs**

List of experiments

Minimum 8 experiments shall be conducted

1. Estimation of Sennosides from Senna.
2. Flourimetric and non-aqueous estimation of Quinine from Cinchona bark.
3. Isolation and evaluation of volatile oils as per Pharmacopoeia.
4. Estimation of Piperine from in Piper nigrum extract by HPLC and spectrometric method.
5. Estimation of Glycyrrhizin by spectrophotometric method.
6. Estimation of Curcumin and color value by spectroscopic method.
7. Preparation and evaluation of Herbal tablets.
8. Preparation and evaluation of Herbal shampoos.
9. Preparation and evaluation of Herbal ointments.
10. Preparation and evaluation of Herbal vanishing creams.
11. Evaluation of antimicrobial activity of Herbal extracts.
12. Handling and gross behavioral studies of experimental animals.

Any related experiments based on Theory.

SCIENTIFIC AND TECHNICAL WRITING

Subject Code : .PCG T 1.207 Sessional : 50
Periods/week : 2 Examination : --
Nature of Exam : Tutorials Exam Duration: --

Course Objectives

To be able to appreciate and understand importance of writing scientifically.

- To Develop competence in writing and abstracting skills.
- To write either a draft research proposal or a chapter of dissertation.

UNIT – I

COLLECTION AND EVALUATION OF INFORMATION

Identification sources, searching information, classifying information under fact/opinion, tabulating information, summarizing a text and presenting sequence of topics in different forms.

UNIT – II

WRITING AS A MEANS OF COMMUNICATION

- Different forms of scientific and technical writing.
- Articles in journals, Research notes and reports, Review articles, Monographs, Dissertations, Bibliographies.

How to formulate outlines: The reasons for preparing outlines
(i) as a guide for plan of writing (ii) as skeleton for the manuscript

Kinds of outline: topic outlines, conceptual outline, sentence outlines and combination of topic and sentence outlines

UNIT – III

DRAFTING TITLES, SUB TITLES, TABLES, ILLUSTRATIONS

- Tables as systematic means of presenting data in rows and columns and lucid way of indicating relationships and results.
- Formatting Tables: Title, Body stab, Stab Column, Column Head, Spanner Head, Box Head
- Appendices: use and guidelines

The Writing process: Getting started, Use outline as a starting device, Drafting, Reflecting and Re-reading
Checking: Organization, Headings, Content, Clarity and Grammar
Brevity and Precision in writing - Drafting and Re-drafting based on critical evaluation

UNIT – IV

PARTS OF DISSERTATION/RESEARCH REPORT/ARTICLE

Introduction, Review of Literature, Methodology, Results and Discussion
Ask questions related to: content, continuity, clarify, validity internal consistency and objectivity during writing each of the above parts.

UNIT – V

WRITING FOR GRANTS

Clearly state the question to be addressed; Rationale and importance of the question being address; Emperial and theoretical conceptualization; Presenting pilot study/data; Research proposal of method; Clarity, specificity of method; Clear organization; Outcome of study and its implications; Budgeting;

Available infra-structure and recourses and Executive summary

References

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2. Cooper, H.M. (1990): Integrating Research: A Guide for Literature Reviews (2nd Edition). California: Sage.
3. Dunn, F.V & Others.(Ed.) (1984): Disserninating Research: Changing Practice. NY:Sage.