Shri Guru Ram Rai University

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s (2f) of UGC Act 1956]

Patel Nagar, Dehradun -248001, Uttarakhand.

Syllabus
For

Pre Ph. D Course Work

PRE PhD SYLLABUS FOR PHARMACEUTICAL CHEMISTRY

Paper Code	Subject Title	Credit	Marks
PRMC 101	**Research Methodology***	**4**	**80**
PRPE 102	**Research & Publication Ethics***	**2**	**40**
PPCC 103	**Advanced Analytical Techniques**	**4**	**80**
PPCE 104	**Phytochemistry**	**4**	**80**
PPCE 105	**Advanced Medicinal Chemistry**	**4**	**80**
PPCE 106	**Pharmaceutical Quality Assurance & Quality Control**	**4**	**80**
PPCE 107	**Indian System of Medicine & Herbal Cosmetics**	**4**	**80**
PPCF 108	**Field Work (Seminar/ conference presentation, review Literature, journal club and other academic activities.)**	**4**	**80**

***Research Methodology & Research & Publication Ethics subjects are compulsory for all specialization.**

Core Subject

Research Methodology (Compulsory)

Code: PRMC 101

(Credit Score-4)

Unit I-Concept & Types of Research

Meaning and importance of Research – Types of Research – Selection and formulation of Research Problem – Research Design, Classification of Research, Pure and Applied Research, Exploring or Formulative Research, Descriptive Research, Diagnostic Research/Study, Evaluation research/Studies, Action Research, Experimental Research, Analytical Study of Statistical Method, Historical Research.

Unit II –Methods Research

Surveys, Case Study, Field Studies General Survey of various Methods including Survey Method, Interdisciplinary Method, Case Study Method, Sampling Method, Statistical Method, Observation Method, Interview Method, Schedule Method, Questionnaire Method, Documentary Method, Library Method, Historical Method and Scientific Method. Characteristic Features of Scientific Method; Empirical Verifiable, Cumulative, Self - Correcting, Deterministic, Ethical & Ideological neutrality (Value Free), Statistical Generalizability.

Unit III - Data Collection and Data Analysis

Collection, Objectives and Classification of Data, Aims, Methods and Objects of Tabulation of Data, Forms and Processes of Interpretation and Presentation of Data.

Primary, Secondary and Tertiary Data.Construction and adaptation of instruments, administration of questions and tests. Data organization in SPSS & Excel, Graphical representation of data

Definition and Aims of Content Analysis, Problems of Content Analysis, Computer and Content Analysis Discussion and Interpretation of results, Testing of Hypothesis: Logical and Statistical Techniques.

Unit IV: Report Writing

Locating Information on a Topic of Interest, Acquiring Copies of Articles of Interest, The Nature of Scientific Variables, Conceptual Versus Operational Definitions of Variables, Levels of Measurement, Various Paradigms, The Basic Format for a Research Report, Identification of the Parts of a Research Report, Citation and Referencing Styles, Essentials of Report Writing, Aids for Writing Good Research Report.

References:

1. Bagchi, Kanak Kanti (2007) Research Methodology in Social Sciences: A Practical Guide, Delhi, Abijeet Publications.

2. Kothari, C.R (2004) Research Methodology: An Introduction, Delhi, New Age.

3.Cooper, R. Donald and Pamela S. Schindler (2003) Business Research Methods, Delhi, Tata McGraw-Hill.

4. Flyvbjerg, Bent (2001) Making Social Science Matter: Why Social Inquiry Fails and How it can Succeed Again, United Kingdom, Cambridge University Press.

5. Goodde and Hatte (1952) Methods in Social Research, New York, McGraw – Hill.

Research & Publication Ethics (Compulsory)

Code: PRPE 102

(Credit Score-2)

RPE 01 PHILOSOPHY & ETHICS (3 hrs)

1. Introduction to Philosophy: definition, nature & scope, concept, branches
2. Ethics: definition, moral Philosophy, nature of moral judgements and reactions

RPE 02 SCIENTIFIC CONDUCT (5 hrs)

1. Ethics with respect to Science and research
2. Intellectual honesty and research integrity
3. Scientific misconduct: falsification, Fabrication, and Plagiarism (FFP)
4. Reductant Publications: duplicate and over lapping publications, salami slicing
5. Selective reporting and misrepresentation of data

RPE 03 PUBLICATION ETHICS (7 hrs)

1. Publication ethics: definition, introduction & importance
2. Best Practices/ standards setting initiatives & guidelines: COPE, WAME, etc
3. Conflict of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior & vice versa, types
5. Violation of publication ethics, authorship & contributorship
6. Identification of publication misconduct, complaints & appeals
7. Predatory publishers & journals

PRACTICE

RPE 04: OPEN ACCESS PUBLISHING (4 hrs)

1. Open access publications & initiatives
2. SHERPA/ RoMEO online resource to check publisher copyright & self- archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer journal Suggester, etc.

RPE 05: PUBLICATION MISCONDUCT (4hrs)

A. **Group Discussion** (2hrs)

1. Subject specific ethical issues, FFP, authorship
2. Conflict of interest
3. Complaints & appeals: examples & fraud from India & abroad

B. Software (2 hrs)

Use of plagiarism software like Turnitin, Urkund, and other open source software tools

RPE 06 : DATABASES AND RESEARCH METRICS (7 hrs)

A. Databases (4hrs)

1. Indexing databases
2. Citation databases: Web of Science, Scopus etc.

B. Research Metrics (3 hrs)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index,i10 index, altmetrics

Core Subject

Advanced Analytical Techniques

Paper Code- PPCC 103

(Credit Score-4)

Unit I Spectroscopy

a. **UV-Visible spectroscopy:** Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect, Woodword'sFieser, Fieser Kuhn and Nelson rule, Spectral correlation with structures of compounds and Applications of UV-Visible spectroscopy.

b. **IR spectroscopy:** Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier -Transform IR Spectrometer, Factors affecting vibrational frequencies, Interpretation of spectra's of compounds and Applications of IR spectroscopy.

c. **Spectroflourimetry:** Theory of Fluorescence, Factors affecting fluorescence, Quencher Instrumentation and Applications of fluorescence spectrophotometer.

d. **NMR spectroscopy:** Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Chemical shift, Factors influencing chemical shift, Spin-Spincoupling, coupling constant, Nuclear magnetic double resonance, Brief outline of principle of FT-NMR, Interpretation of spectra's of compounds to the structure elucidation.

e. **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, Applications of mass spectroscopy to structural elucidation of compounds .GC-MS and LC-MS Principle and Application.

Unit II 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)HPTLC

i) Electrophoresis.

Unit III Immunological assays

RIA (Radio immuno assay), ELISA, Bioluminescence assays.

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

Elective Subject

Phytochemistry

Paper Code- PPCE 104

(Credit Score-4)

Unit I 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, Quercitin. c) Steroids: Hecogenin, guggulosterone and withanolides d) Coumarin: Umbelliferone. e) Terpenoids: Cucurbitacins.

Unit II 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.

Unit III 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, Methods of fractionation. Separation of phytoconstituents by latest CCCET, SCFE techniques including preparative HPLC and Flash column chromatography.

Unit IV Phytochemical finger printing

HPTLC and LCMS/GCMS applications in the characterization of herbal extracts.Structure elucidation of phytoconstituents. Structure elucidation of the following compounds by spectroscopic techniques like UV, IR, MS, NMR (1H, 13C)

a. Carvone, Citral, Menthol

b. Luteolin, Kaempferol

c. Nicotine, Caffeine

d. Glycyrrhizin.

Unit V 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. Testing of natural products and drugs: Herbal medicines - clinical laboratory testing. Stability testing of natural products, protocols.

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

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 Medicinal 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. 1 onwards IWPAC.
12. Modem Methods of Plant Analysis-Peach & M.V. Tracey, Vol. I & II
13. Medicinal Natural products – a biosynthetic approach, Dewick PM, John Wiley & Sons, Toronto, 1998.
14. Chemistry of Natural Products, Bhat SV, Nagasampagi BA, Meenakshi S, Narosa Publishing House, New Delhi.
15. Pharmacognosy & Phytochemistry of Medicinal Plants, 2nd edition, Bruneton J, Interceptt Ltd., New York, 1999.

Elective Subject

Advanced Medicinal Chemistry

Paper Code- PPCE 105

(Credit Score-4)

Unit I Drug discovery and design

Introduction to Computer aided drug design, Molecular modeling methods, molecular mechanics, molecular dynamics, principle of Molecular docking, Rigid docking, flexible docking and extra-precision docking, concept of prodrug design, concept of combinatorial chemistry, high throughput screening, 3D- QSAR based COMFA and COMSIA approaches.

Unit II Molecular Properties and Drug Design

Prediction and analysis of ADMET properties of new molecules and its importance in drug design.De novo drug design: Receptor/enzyme-interaction and its analysis, Receptor/enzyme cavity size prediction, predicting the functional components of cavities, Fragment based drug design. Homology modeling and generation of 3D-structure of protein.

Unit III Targets for development of drugs

Systematic study, SAR, Mechanism of action and synthesis of recently developed drugs and molecules in development pipeline for following diseases: cancer, tuberculosis, malaria, epilepsy, and cardiovascular diseases.

Unit IV Pharmacophore Mapping and Virtual Screening

Concept of pharmacophore, pharmacophore mapping, identification of Pharmacophore features and Pharmacophore modeling; Conformational search used in pharmacophore mapping. In Silico Drug Design and Virtual Screening Techniques Similarity based methods and Pharmacophore based screening, structure based In-silico virtual screening protocols

Unit V Green Chemistry:

Introduction, principles of green chemistry

Microwave assisted reactions: Merit and demerits of its use, increased reaction rates, mechanism, superheating effects of microwave, effects of solvents in microwave assisted synthesis, microwave technology in process optimization, its applications in various organic reactions and heterocycles synthesis

Ultrasound assisted reactions: Types of sonochemical reactions, homogenous, heterogeneous liquid-liquid and liquid-solid reactions, synthetic applications

Continuous flow reactors: Working principle, advantages and synthetic applications.

References:

1. Medicinal Chemistry by Burger, Vol I –VI.
2. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, 12th Edition, Lppincott Williams & Wilkins, Woltess Kluwer (India) Pvt.Ltd, New Delhi.
3. Comprehensive Medicinal Chemistry – Corwin and Hansch.
4. Computational and structural approaches to drug design edited by Robert M Stroud and Janet. F Moore, RCS Publishers.
5. Principles of Medicinal Chemistry by William Foye, 7th Edition, Ippincott Williams & Wilkins, Woltess Kluwer (India) Pvt.Ltd, New Delhi.
6. Drug Design by Ariens Volume 1 to 10, Academic Press, 1975, Elsevier Publishers
7. Principles of Drug Design by Smith.
8. The Organic Chemistry of the Drug Design and Drug action by Richard B. Silverman, II Edition, Elsevier Publishers, New Delhi.
9. An Introduction to Medicinal Chemistry, Graham L.Patrick, III Edition, Oxford University Press, USA.
10. Introduction to Quantitative Drug Design by Y.C. Martin, CRC Press, Taylor & Francis group..
11. Principles of Drug Design by Smith and Williams, CRC Press, Taylor & Francis.
12. The Organic Chemistry of the Drug Design and Drug action by Richard B. Silverman, Elsevier Publishers.
13. An Introduction to Medicinal Chemistry –Graham L. Patrick, Oxford University Press.
14. Comprehensive Medicinal Chemistry – Corwin and Hansch, Pergamon Publishers.
15. Computational and structural approaches to drug design edited by Robert M Stroud and Janet. F Moore

Elective Subject

Pharmaceutical Quality Assurance & Quality Control

Paper Code- PPCE 106

(Credit Score-4)

Unit I Quality Control and Quality Assurance

a. Concept and evolution and scopes of Quality Control and Quality Assurance, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Q-series guidelines.
b. **Good Laboratory Practices:** Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non-clinical testing, control on animal house, report preparation and documentation. CPCSEA guidelines.

Unit II Pharmaceutical quality Management

Basics of Quality Management, Total Quality Management (TQM), Principles of Six sigma, ISO 9001:2008, 9001:2015, ISO14001:2004, Pharmaceutical Quality Management – ICH Q10, OSHAS guidelines, NABL certification and accreditation, CFR-21 part 11, WHO GMP requirements.

Unit III Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC)

Purchase specifications and maintenance of stores for raw materials. In process quality control and finished products quality control for following dosage forms in Pharma industry according to Indian, US and British pharmacopoeias: tablets, capsules, ointments, suppositories, creams, parenteral, ophthalmic and surgical products.

Unit IV Qualification

User requirement specification, Design qualification, Factory Acceptance Test (FAT)/Site Acceptance Test (SAT), Installation qualification, Operational qualification, Performance qualification, Re-Qualification (Maintaining status- Calibration Preventive Maintenance, Change management).

Qualification of analytical instruments: UV-Visible spectrophotometer, FTIR, DSC,GC, HPLC, HPTLC, LC-MS.

Unit V Validation

Definition of Calibration, Qualification and Validation, Scope, frequency and importance.Difference between calibration and validation.Calibration of weights and measures. Advantages of Validation, scope of Validation, Organization for Validation, Validation Master plan, Types of Validation, Streamlining of qualification & Validation process and Validation Master Plan.

a. **Analytical method validation:** General principles, Validation of analytical method as per ICH guidelines (Q2) and USP.
b. **Cleaning Validation:** Cleaning Method development, Validation of analytical method used in cleaning, Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP). Validation of facilities in sterile and non-sterile plant.

References:

1. Quality Assurance Guide by organization of Pharmaceutical Procedures of India, 3rd revised edition, Volume I & II, Mumbai, 1996.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69, Marcel Dekker Series, 1995.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I & II, 2nd edition, WHO Publications, 1999.
4. How to Practice GMP's – P P Sharma, Vandana Publications, Agra, 1991. 126
5. The International Pharmacopoeia – vol I, II, III, IV & V - General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms, 3rd edition, WHO, Geneva, 2005.
6. Good laboratory Practice Regulations – Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
7. ICH guidelines
8. ISO 9000 and total quality management
9. QA Manual – D.H. Shah, 1st edition, Business Horizons, 2000.
10. Good Manufacturing Practices for Pharmaceuticals a plan for total quality control – Sidney H. Willig, Vol. 52, 3rd edition, Marcel Dekker Series.
11. Organizing for High Performance: Employee Involvement, TQM, Reengineering, and Knowledge Management in the Fortune 1000: The CEO Report By Edward E. Lawler;

Susan Albers Mohrman; George Benson, Jossey-Bass, 2001 Corporate Culture and the Quality Organization By James W. Fairfield- Sonn, Quorum Books, 2001

12. The Quality Management Sourcebook: An International Guide to Materials and Resources By Christine Avery; Diane Zabel, Routledge, 1997
13. Juran's Quality Handbook, Sixth Edition, Joseph M. Juran and Joseph A. De Feo, ASQ Publications
14. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
15. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
16. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed ImtiazHaider

Elective Subject

Indian System of Medicine & Herbal Cosmetics

Paper Code- PPCE 107

(Credit Score-4)

Unit I Indian System of Medicine & Herbal Cosmetics

Fundamental concepts of Ayurveda, Siddha, Unani and Homoeopathy systems of medicine Different dosage forms of the ISM. Ayurveda Ayurvedic Pharmacopoeia, Analysis of formulations and bio crude drugs with references to: Identity, purity and quality. Siddha: Gunapadam (Siddha Pharmacology), raw drugs/Dhatu/Jeevam in Siddha system of medicine, Purification process (Suddhi).

Unit II 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 ISM formulation industry - GAP, GMP and GLP.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. TKDL, Geographical indication Bill, Government bills in AYUSH, ISM, CCRAS, CCRS, CCRH, CCRU.

Unit III 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.

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

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, Preparation and standardisation of the following : Tonic, Bleaches, Dentifrices and Mouth washes & Tooth Pastes, Cosmetics for Nails. 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.

References:

1. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine by Pulok K Mukharjee (2003), Ist Edition, Business horizons Robert Verpoorte, New Delhi.
2. Quality control of herbal drugs by Pulok K Mukarjee (2002), Business Horizons Pharmaceutical Publisher, New Delhi.
3. PDR for Herbal Medicines (2000), Medicinal Economic Company, New Jersey.
4. Indian Herbal Pharmacopoeia (2002), IDMA, Mumbai.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (1996), Nirali Prakashan, New Delhi.
6. Ayurvedic Pharmacopoeia, The Controller of Publications, Civil Lines, Govt.ofIndia,New Delhi.
7. Hand Book on Ayurvedic Medicines, H. Panda, National Institute of Industrial Research, New Delhi.
8. Ayurvedic System of Medicine, Kaviraj Nagendranath Sengupata, Sri Satguru Publications, New Delhi.
9. Ayurvedic Pharmacopoeia. Formulary of Ayurvedic Medicines, IMCOPS, Chennai.
10. Homeopathic Pharmacopoeia. Formulary of Homeopathic Medicines, IMCOPS, Chennai.
11. Homeopathic Pharmacy: An introduction & Handbook, Steven B. Kayne, Churchill Livingstone, New York.
12. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
13. British Herbal Pharmacopoeia, British Herbal Medicine Association, UK.

14. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine, Pulok K Mukharjee, Business Horizons, New Delhi.
15. Indian System of Medicine and Homeopathy in India, Planning and Evaluation Cell, Govt. of India, New Delhi.
16. Essential of Food and Nutrition, Swaminathan, Bappco, Bangalore.
17. Clinical Dietitics and Nutrition, F.P. Antia, Oxford University Press, Delhi.
18. Yoga - The Science of Holistic Living by V.K.Yoga, Vivekananda Yoga Prakashna Publishing, Bangalore.
19. Panda H. Herbal Cosmetics (Hand book), Asia Pacific Business Press Inc, New Delhi.
20. Thomson EG. Modern Cosmetics, Universal Publishing Corporation, Mumbai.
21. P.P.Sharma. Cosmetics - Formulation, Manufacturing & Quality Control, Vandana Publications, NewDelhi.
22. Supriya KB. Handbook of Aromatic Plants, Pointer Publishers, Jaipur.
23. Skaria P. Aromatic Plants (Horticulture Science Series), New India Publishing Agency, New Delhi.
24. KathiKeville and Mindy Green. Aromatheraphy (A Complete Guide to the Healing Art), Sri Satguru Publications, New Delhi.
25. Chattopadhyay PK. Herbal Cosmetics &Ayurvedic Medicines (EOU), National Institute of Industrial Research, Delhi.
26. Balsam MS & Edward Sagarin. Cosmetics Science and Technology, Wiley Interscience, New York.