

**Sri Dev Suman Uttarakhand University,
Badsahithaul, Tehri (Garhwal), Uttarakhand**

**Vocational/Skill Development Course-I
On
“Cosmetics and Perfumes Chemistry”**




Department of Chemistry
Pt. Lalit Mohan Sharma SDS Uttarakhand University Campus,
Rishikesh, Uttarakhand.

Vocational/Skill Development Courses
Semester I/II
Paper I (Theory)
Course title: Cosmetics and Perfumes Chemistry

Programme/Class: Certificate in Science	Year : First	Semester: First
Paper-I Theory Subject : Vocational/Skill Development Course		
Course Code:	Course Title : Cosmetics and Perfumes Chemistry	

Course Outcomes: Cosmetics are products designed to cleanse, protect and change the appearance of external parts of our bodies. The key ingredients present in most cosmetics include water, emulsifiers, preservatives, thickeners, moisturisers, colours and fragrances. Ingredients can be naturally occurring or artificial, but any potential impact on our health depends mainly on the chemical compounds they are made of.

Perfumes are the mixture of fragrant essential oils or aroma compounds (fragrances), fixatives and solvents, usually in liquid form, used to give the human body, animals, food, objects, and living-spaces a pleasant scent. Perfumes are essentially a blend of complementary ingredients and essential oils. Therefore, the perfumes are complex combinations of natural and/or man-made substances that are added to many consumer products to give them a distinctive smell.

The salient feature of this programme is the emphasis being laid on the overall development of student with major focus on application and filed work. The course manly focuses on Cosmetics, Advances in cosmetic product development, Perfume Chemistry, Learning of analytical techniques used in cosmetic and perfume industries etc. Students will get many opportunities of interactions with experts in these fields during the course tenure. The students can gain hands on experience in the field while doing internships in industries/research institutes/health sectors etc.

Course Objectives: To provide the learner with knowledge of cosmetics and perfumes with respect to the types of formulations, evaluation and regulatory aspects.

Course Outcome: Upon completion of the course, the learner shall be able to:

1. Discuss the various raw materials for cosmetics and perfumes.
2. Understand the toxicological aspects.
3. Discuss the various cosmetics products w.r.t. raw materials, large scale manufacturing and functional and physiochemical evaluation.
4. Know the regulatory guidelines and sensorial assessment for cosmetics.

Credits : 02	Compulsory
Max. Marks 25 + 75	Min. Passing Marks:....
Total number of hours = 30	

Unit	Content	Number of Hours
1	Introduction, history, classifications and sources of cosmetics and perfumes.	6
2	Surfactants and their types; Additives (thickeners, foam stabilizers, pearlescent agents, conditioning agents, etc.) Oil components; Waxes; Silicone oils; Cream bases; Emulsifiers; Humectants; Aerosol Propellants.	08
3	Chemistry and production of essential oils with special reference to the following; Eugenol, Geraniol, Sandalwood oil, eucalyptus oil, rose oil, Jasmone, Civet one, Muscone.	08
4	Psychological benefits, fragrance and mood, aromatic substances, types of aromatic substances, chemical constituents of aromatic substances, odours of substances from vegetable, animal and artificial origin	08

Suggested Continuous Evaluation Methods: Students can be evaluated on the basis of score obtained in a mid-term exam, together with the performance of other activities which can include short exams, in-class or online tests, home assignments, group discussions or oral presentations.

Evaluation method	Marks
Home assignments/ group discussions/ oral presentations	10 marks
Mid-term evaluation (written test)	10 marks
Attendance	05 marks

Course prerequisites: To study this course, a student must have studied the chemistry of class 12th standard.

Suggested Readings:

1. Earnest Guenther, "The Essential Oils" vol. I Robert E. Kreiger Publishing Co. Huntington, New York, 1972.
2. M.S. Balsam, S.D. Genshon, M.M. Rieger, E. Sagarin, S.J. Strianase, "Cosmetics, Science and Technology, Vol. I, II and III, Wiley-Interscience, A Division of John Wiley and Sons., Inc., New York, London, Sydney, Toronto, 1972, Ed. By M.S. Balsam and M.S. Sagarin.
3. Paul Z. Bedoukian, " Perfumery and Flavouring Synthetics" II Edn, Elsevier Publishing Co., Amsterdam, London, New York, 1967.
4. J. Stephan Jellinick," Formulation and Functions of Cosmetics", Wiley Interscience, a Division of John Wiley & Sons., Inc.
5. Mareel IBillot, F.V. Wells," Perfumery Technology" Ellis Harwood Ltd., Halrted Press, a Division of John Wiley & Sons., Inc. New York, London, 1975.

6. Chemistry and Technology of the Cosmetics and Toiletries Industry ed. By D.F. Williams & W.H., Schmitt, Blackie Academic & Professional, London, 1st Edn., 1992.
7. Harry's Cosmeticology, sixth edn. The principles and Practice of Modern cosmetics, Vol. I by R.G. Harry Chemical Publishing Co., Inc., New York, 1973.
8. H. Panda, Perfumes and Flavours Technology Handbook, Asia Pacific Business Press Inc., 2010, Delhi.
9. N. Board, Handbook on Herbal Products (Medicines, Cosmetics, Toiletries, Perfumes) National Institute of Industrial Research, 2000, New Delhi
10. M. Vimla Devi Textbook of herbal Cosmetics, CBS Publishers and Distributors Pvt. Ltd.
11. HimadriPanda, HerbalcosmeticsHandbook.3rd revised edition.
12. W.A. Wani, P.F. Iqbal and M.N. Lone, Chemistry of cosmetics and perfumes, Lifestyle & Personal Style Guides.
13. Krik Othmer, Chemical Technology of cosmetics, John Wiley.
14. A.M. Dar and B.A. Dar, Chemistry of cosmetics & Perfumes, Kalyani Publications.
15. S.V. Bhat, B.A. Nagasampagi and M. Sivakumar, Chemistry of Natural Products, Narosa Publication

Programme/Class: Certificate in Science	Year : First	Semester: First
Paper-II Practical Subject : Vocational/Skill Development Course		
Course Code:	Course Title : Cosmetics and Perfumes Chemistry	

Course Outcomes: The students will have the knowledge and skill to understand the laboratory methods and test related to inorganic mixtures and Chromatographic techniques. Also, they can understand the preparation of standard solutions and standardization of volumetric apparatus.

Credits : 01	Compulsory
Max. Marks 10 + 40	Min. Passing Marks: 17
Total number of hours = 30	

Unit	Content	Number of Hours
1	Preparation of Standard solutions: 1 Normal, 1 Molar, % w/v solution, % v/v solution. Standardization of volumetric apparatus.	10
2	Analysis of heavy metals- Lead and Mercury. Determination of chlorides and sulphates.	10
3	Paper and Thin Layer Chromatography	10

Suggested Continuous Evaluation Methods: Students can be evaluated on the basis of score obtained in viva voce, record and overall performance.

Evaluation Method	Marks
Attendance	05

Course prerequisites: To study this course, a student must have studied the chemistry of class 12th standard.

Distribution of marks shall be as given below

1. Preparation of Standard Solutions and standardization of volumetric apparatus	12
2. Inorganic analysis	10
3. Paper and Thin Layer Chromatography	08
4. Viva	05
5. Record	05
6. Home assignments/internal assignment, lab record and attendance	10
Total	50

Note:

- The lab work of the student has to be evaluated and assessed carefully and periodically.
- The semester lab record has to be maintained by the department/college as an official record.
- Less than zero mark will not be awarded.
- The total number of students to be examined per batch shall not be more than sixty.
- Duration of the practical examination shall be 04(four) hours.

Suggested Readings:

1. J. Mendham Vogel's Quantitative Chemical Analysis, Pearson, 2009.
2. S.M. Khopkar, Basic concepts of analytical chemistry, New Age International Publisher, 2009.
3. A.K. Nad, B. Mahapatra and A. Ghoshal, An advanced course in practical Chemistry, New Central Book Agency (P) Ltd
4. Anju Goyal and Harish Kumar, Advanced Techniques of Analytical Chemistry, Bentham Books.
5. Jagdamba Singh, R.K.P.Singh, Jaya Singh, L.D.S. Yadav, I.R. Siddiqui and Jaya Shrivastava, Advanced Practical Chemistry, Pragati Prakashan



Programme/Class: Certificate in Science	Year : First	Semester: Second
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Paper-I Theory Subject : Vocational/Skill Development Course

Course Code:	Course Title : Cosmetics and Perfumes Chemistry
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Credits : 02	Compulsory
Max. Marks 25 + 75	Min. Passing Marks: 33
Total number of hours = 30	

Unit	Content	Number of Hours
1	Developmental and role of natural products in cosmetic and medicine. Herbs description and morphology of organized and un-organized herbs.	5
2	Different systems of classification of natural excipients, their merits and demerits.	5
3	Adulteration of Natural products : Quantitative & quantitative methods of detection of adulteration.	10
4	Fixatives :- Introduction , sources, classification, chemical composition and uses of following – a. Animal Source :- Civet, Musk, Ambergris b. Resinous Fixatives – Benzoins, Balsams, Myrrh, Cinnamyl Alcohol, Orris, Vanillin. c. Essential Oils fixatives – Sandal wood , lemon, cinnamon, patchouli oil, Phenyl acetaldehyde, vanillin. d. Synthetics fixatives – Diethyl phthalate Benzyl- Benzoate, alcohols Acetophenone, musk-ketone, musk- Ambrette, Heliotropin, hydroxy citronellal, indole.	10

Suggested Continuous Evaluation Methods: Students can be evaluated on the basis of score obtained in a mid-term exam, together with the performance of other activities which can include short exams, in-class or online tests, home assignments, group discussions or oral presentations.

Evaluation method	Marks
Home assignments/ group discussions/ oral presentations	10 marks
Mid-term evaluation (written test)	10 marks

Attendance	05 marks
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Course prerequisites: To study this course, a student must have studied the chemistry of class 12th standard.

Suggested Readings:

1. Earnest Guenther, "The Essential Oils" vol. I Robert E. Kreiger Publishing Co.
a. Huntington, New York, 1972.
2. M.S. Balsam, S.D. Genshon, M.M. Rieger, E. Sagarin, S.J. Strianase, "Cosmetics, Science and Technology, Vol. I, II and III, Wiley-Interscience, A Division of John Wiley and Sons., Inc., New York, London, Sydney, Toronto, 1972, Ed. By M.S. Balsam and M.S. Sagarin.
3. Paul Z. Bedoukian, " Perfumery and Flavouring Synthetics" II Edn, Elsevier Publishing Co., Amsterdam, London, New York, 1967.
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Programme/Class: Certificate in Science	Year : First	Semester: Second
Paper-II Practical Subject : Vocational/Skill Development Course		
Course Code:	Course Title : Cosmetics and Perfumes Chemistry	

Course Outcomes: The students will have the knowledge and skill to understand the laboratory methods and test related to determination of pH, viscosity and surface tension. Also, they can understand the Determination and significance of saponification value.

Credits : 01	Compulsory
Max. Marks 10 + 40	Min. Passing Marks: 17
Total number of hours = 30	

Unit	Content	Number of Hours
1	Determination of pH, surface tension and viscosity	10
2	Different methods of extraction for herbal raw materials.	10
3	Determination & significance of saponification value	10

Suggested Continuous Evaluation Methods: Students can be evaluated on the basis of score obtained in viva voce, record and overall performance.

Evaluation Method	Marks
Attendance	05
Viva voce/Record and overall performance	05

Course prerequisites: To study this course, a student must have studied the chemistry of class 12th standard.

Distribution of marks shall be as given below

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|--|-----------|
| 1. Determination of pH, surface tension and viscosity | 10 |
| 2. Extraction methods | 10 |
| 3. Determination & significance of saponification value. | 10 |
| 4. Viva | 05 |
| 5. Lab Record | 05 |
| 6. Home assignments/internal assignment, lab record and attendance | 10 |
| Total | 50 |

Note:

- The lab work of the student has to be evaluated and assessed carefully and periodically.

- The semester lab record has to be maintained by the department/college as an official record.
- Less than zero mark will not be awarded.
- The total number of students to be examined per batch shall not be more than sixty.
- Duration of the practical examination shall be 04(four) hours.

Suggested Readings:

1. J. Mendham Vogel's Quantitative Chemical Analysis, Pearson, 2009.
2. S.M. Khopkar, Basic concepts of analytical chemistry, New Age International Publisher, 2009.
3. A.K. Nad, B. Mahapatra and A. Ghoshal, An advanced course in practical Chemistry, New Central Book Agency (P) Ltd
4. Anju Goyal and Harish Kumar, Advanced Techniques of Analytical Chemistry, Bentham Books.
5. Jagdamba Singh, R.K.P. Singh, Jaya Singh, L.D.S. Yadav, I.R. Siddiqui and Jaya Shrivastava, Advanced Practical Chemistry, Pragati Prakashan
6. Krik Othmer, Chemical Technology of cosmetics, John Wiley.
7. A.M. Dar and B.A. Dar, Chemistry of cosmetics & Perfumes, Kalyani Publications.

Vocational/Skill Development Course-II
On
“Organic Spectroscopy”



Department of Chemistry

**Pt. Lalit Mohan Sharma SDS Uttarakhand University Campus,
Rishikesh, Uttarakhand.**

Vocational/Skill Development Course-II

Semester I

Paper-I (Theory)

Course Title: BASIC ANALYTICAL CHEMISTRY

Programme/Class: Certificate in Science	Year: First	Semester: First
Paper-I Theory Subject: Vocational/Skill Development Course		
Course Code	Course Title: BASIC ANALYTICAL CHEMISTRY	

Course Objectives: This course is value-based and/or skill-based and is aimed at providing hands-on-training, competencies, skills, etc. This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge. Basic analytical techniques will be taught in this course.

Course outcomes: After completion of the course, the student shall be able to-

Characterize/test various organic/inorganic molecules using different analytical techniques.

Distinguish two different compounds using various analytical techniques.

Learn various sampling methods and can work as a sample analyst

Credits: 04	Compulsory
Max. Marks: 25 + 75	Min. Passing Marks: 33
Total Number of Hours : 30	

Unit- 1:.(6 Hrs)

Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

Unit- 2.(6 Hrs)

Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators a. Determination of pH of soil samples. b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

Unit- 3.(6 Hrs)

Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods. a. Determination of pH, acidity and alkalinity of a water sample. b. Determination of dissolved oxygen (DO) of a water sample.

Unit- 4.(6 Hrs)

Analysis of food products & Analysis of cosmetics: Nutritional value of foods, idea about food processing and food preservations and adulteration.

- a. Identification of adulterants coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.

- b. Analysis of preservatives and colouring matter.
- c. Major and minor constituents of Analysis of cosmetics and their function-
- Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.
- Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

Unit- 5: (6 Hrs)

Chromatography: Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

- a. Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+}).
- b. To compare paint samples by TLC method.
- c. Determination of ion exchange capacity of anion / cation exchange resin by batch procedure
- d. Spectrophotometric determination of Iron in Vitamin / Dietary Tablets / Caffeine and Benzoic Acid in Soft Drink.

Evaluation method	Marks
Home assignments/ group discussions/ oral presentations	10 marks
Mid-term evaluation (written test)	10 marks
Attendance	05 marks

Reference:

1. Willard, H. H. Instrumental Methods of Analysis, CBS Publishers.
2. Skoog & Lerry. Instrumental Methods of Analysis, Saunders College Publications, New York.
3. Skoog, D.A.; West, D.M. & Holler, F.J. Fundamentals of Analytical Chemistry 6th Ed., Saunders College Publishing, Fort Worth (1992).
4. Day, R. A. & Underwood, A. L. Quantitative Analysis, Prentice Hall of India.
5. Vogel, A. I. Vogels Qualitative Inorganic Analysis 7th Ed., Prentice Hall.

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Vocational/Skill Development Course-II

Semester II

Paper-I (Theory)

Course Title: Organic Spectroscopy

Programme/Class: Certificate in Science	Year: First	Semester: Second
Paper-I Theory Subject: Vocational/Skill Development Course		
Course Code	Course Title: Organic Spectroscopy	

Course Objectives: Spectroscopy is the demand of the day, this course will make student familiar with different Spectroscopic methods, so the he/she may be able to characterize and identify various compounds that are synthesized in laboratory or isolated from plants or any other source. Basic spectroscopic techniques along with their spectral characterization will be taught in this course.

Course outcomes: After completion of the course, the student shall be able to-

1. Characterize various organic molecules using different spectroscopic techniques.
2. Distinguish two different compounds by comparing their various spectroscopic data.

Credits: 04	Compulsory
Max. Marks: 25 + 75	Min. Passing Marks: 33
Total Number of Hours : 30	

UNIT-1: Ultraviolet -Visible absorption spectroscopy: (8 Hrs)

Merits of spectroscopic analysis, Electromagnetic radiation, Wavelength, frequency, wave number and their relation, Absorption spectra, absorbance, Absorption laws-Beers, Lambert Law and Beer-Lambert Law, molar absorptivity, Presentation of UV spectra, types of electronic transitions, Concept of chromophore and auxochrome, Effect of solvents (polarity) and conjugation on absorption maxima, Bathochromic (Red Shift), hypsochromic (Blue Shift), hyperchromic and hypochromic effect , UV spectra of dienes and Woodward — Fieser Rules , Applications of UV- visible spectroscopy

UNIT-2: Infrared (IR) absorption spectroscopy: (08 Hrs)

Introduction, IR active and in-active molecules, Molecular vibrations - stretching and bending vibrations, Fundamental bands, Vibrational transitions and degree of freedom, Hookes Law, selection rules, intensity and position of IR bands, Factors affecting vibrational frequencies, Fermi resonance, Instrumentation, measurement of IR spectrum, solvents, Functional Groups region, fingerprint region, Characteristic absorptions of various functional groups, Interpretation of IR spectra of simple organic compounds, Applications of IR spectroscopy.



UNIT-3: Nuclear Magnetic Resonance Spectroscopy (NMR): (10 Hrs)

Principle of Protonmagnetic resonance spectroscopy, Origin of Signal, Number signals-equivalent and non-equivalent protons, Position of signals - shielding and deshielding of protons, Peak area and proton counting , Chemical shift, units, scales, δ values of different types of protons, factors affecting δ ., Splitting of Signals - Spin — Spin Coupling ,coupling constants, magnetic equivalence of protons, Applications of NMR Spectroscopy. Interpretation of PMR spectra of ethanol, acetaldehyde, ethyl bromide, n-propyl bromide, isopropyl bromide, 1, 1-dibromoethane, 1, 1, 2- tribromoethane, etyl acetate, toluene, benzaldehyde and acetophenone.

UNIT-4: Structure Elucidation: (4 Hrs)

Structure elucidation of organic molecules on the basis of UV-Visible, IR, NMR Spectral data, chemical properties and molecular weight..

Evaluation method	Marks
Home assignments/ group discussions/ oral presentations	10 marks
Mid-term evaluation (written test)	10 marks
Attendance	05 marks

References:

1. Morrison, R.T. and Boyd, R.T.; Organic Chemistry, Pearson Education
2. Soloman, Fundamentals of Organic Chemistry, Wiley
3. Dhawan, Organic Chemistry, Vol III, Pradeep Publication
4. Y.R. Sharma, Spectroscopy, S. Chand Co, New Delhi
5. Jagdamba Singh, UGC Organic Chemistry Vol III, Pragati Prakashan , Meerut
6. Jagmohan; Organic Spectroscopy

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