

Syllabus prescribed for 2024-25		
M. Sc. Herbal Science	Semester-IV	
Code of the Course Subject DSC I.4	Title of the Course/ Subject Plant Nutraceuticals and Cosmetics	No. of Periods/week 04 Credits = 04
COs :		
<ol style="list-style-type: none"> 1. Students will understand the basics of nutraceuticals and cosmetics. 2. Students will learn about various plant-based nutraceuticals and their health importance. 3. Students will have focal idea about plant-based cosmetics and their applications. 		
Unit: I:	Kinds of Nutrients in natural foods:	
	<ol style="list-style-type: none"> 1.1 Carbohydrates: Sources, properties and benefits 1.2 Proteins: Sources, properties and benefits 1.3 Vitamins and Minerals: Sources, properties and benefits 1.4 Dietary fibers :Sources, Properties and benefits 	
Unit- II:	Nutraceuticals- I:	
	<ol style="list-style-type: none"> 2.1 Introduction, classification, and sources of Nutraceuticals, 2.2 Functional Foods: Definition, Relation of functional foods and Nutraceuticals to Food and drugs, 2.3 Application of herbs as functional foods, 	
Unit- III:	Nutraceuticals- II:	
	<ol style="list-style-type: none"> 3.1 Concept of free radicals and antioxidants, 3.2 Nutritive and Non-nutritive food components with potential health effects 3.3 Herbal nutraceuticals as an alternative to pharmaceuticals 	
Unit- IV:	Nutraceuticals III:	
	<ol style="list-style-type: none"> 4.1 Pigments as nutraceuticals (Curcumin, Chlorophyll and Carotene) 4.2 Anti-nutritional factors (Lectins, Tannins and Phytic acid) 4.3 Fortified foods. 	
Unit- V:	Cosmetics- I	
	<ol style="list-style-type: none"> 5.1 Fundamentals of Cosmetic technology 5.2 Classification of cosmetics 5.3 Raw materials used for cosmetics- Surfactants, cream bases, aerosol propellants and perfumes. 	
Unit- VI	Cosmetics- II	
	<ol style="list-style-type: none"> 6.1 Self-life, effects of environmental factors on cosmetic product stability. 6.2 Quality control tests for various cosmetic products. 6.3 Packaging of different cosmetics. 	
Practical's: Plant Nutraceuticals and Cosmetics:		
<ol style="list-style-type: none"> 1) Estimation of vitamin C from Citrus/amla fruits 2) Separation of plant pigments Chlorophylls and carotenes by Paper chromatography/ TLC 3) Estimation of chlorophyll, anthocyanins and carotenes 4) Preparation of Soymilk 5) Determine/ test the availability of vitamins 6) Determine the antioxidant activity of the given plant sample 7) Preparation of Shampoos 8) Preparation of Hair creams 9) Preparation of Nail polish 10) Preparation of Tooth powder/ tooth paste 		
Suggested Reading:		
<p>Alamgir, A. L. M. (2017) Therapeutic use of medicinal plants and their extracts: Vol.1, Pharmacognosy. Springer publication</p> <p>Daley, D. K. (2017) Plant Crude Drugs. Pharmacognosy, 2017, 81-89.</p> <p>Kamboj, A. (2012). Analytical Evaluation of Herbal Drugs, Drug Discovery Research in Pharmacognosy, Prof. OmboonVallisuta (Ed.), ISBN: 978-953-51-0213-7, InTech</p>		

Koche, D., Shirsat, R. and Kawale, M (2016) An overview of major classes of phytochemicals: Their types and role in disease prevention.

Mishra, A.P. *et al.* (2022). The Role of Nutraceuticals as Food and Medicine, Types and Sources. In: Egbuna, C., Sawicka, B., Khan, J. (eds) Food and Agricultural Byproducts as Important Source of Valuable Nutraceuticals. Springer, Cham

Nasri H, Baradaran A, Shirzad H, Rafieian-Kopaei M. (2014) New concepts in nutraceuticals as an alternative for pharmaceuticals. *Int J Prev Med*;5(12):1487-99.

Pise, A. G., Pise, S., Sreedhar, D., Ligade, V., Janodia, M. Udupa, N. (2000) Nutraceuticals and Pharmaceuticals: A comparative analysis, *Research and Reviews*, 2: 3-6.

Ramesh, S. V. and Praveen, S. (2022) Plant based Nutraceuticals In SVR., Praveen S. (Eds) Conceptualizing plant based nutrition. Springer, Singapore.

Ronis MJJ, Pedersen KB, Watt J. (2018) Adverse Effects of Nutraceuticals and Dietary Supplements. *Annu Rev PharmacolToxicol.* 2018, 58:583-601.

Sofowora A, Ogunbodede E, Onayade A. The role and place of medicinal plants in the strategies for disease prevention. *Afr J Tradit Complement Altern Med.* 2013 Aug 12;10(5):210-29.

Learning Outcomes:

- Students will be able to analyze various plant drug samples available in the market
- Students could differentiate various nutraceuticals and their use in health maintenance and could perceive a career as a dietician and cosmetologist.

M. Sc. II, Semester- IV (Herbal Science)

**Practical: XIII/ Lab- XIII
(Plant Nutraceuticals) (DSC I.4)
(2 hrs/ week; Credits= 01)**

Time: 3.00 Hrs]

**[Total Marks: 50
(Internal: 25 Marks and External: 25 marks)**

Internal Practical Examination:

1. Overall performance	10 M
2. Report of visit to any National Institute/ Industry/Assignment/Survey	10 M
3. Attendance	05 M
Total	25 M

External Practical Examination:

1. To determine antioxidant activity	10 M
2. Estimation of Vitamins in given sample	05 M
3. <i>Viva- voce</i>	05 M
4. Practical record submission	05 M
Total	25 M

M. Sc. Herbal Science		Semester-IV	
Code of the Course Subject	Title of the Course/ Subject	No. of Periods/week	
DSC II.4	Indian System of Medicine-II (Siddha, Unani and Tibetan)	04 Credits = 04	
COs :			
<ul style="list-style-type: none"> The students will acquire the basic knowledge of Siddha, Unani and Tibetan systems of medicine. They can compare formulations of different systems. The students will learn about various formulations in alternative traditional medicine. 			
Unit- I:	Introduction to Siddha: 1.1 Principles and practice- basis of the Siddha system, the concept of disease, Siddha diagnosis, and treatment. 1.2 Classification of treatment according to the Siddha system of medicine – 1.2.1 Purgative therapy, Emetic therapy, Fasting therapy, 1.2.2 Steam therapy, Oleation therapy, Solar therapy, 1.2.3 Blood-letting therapy and Yoga therapy		
Unit- II:	Siddha medicines: 2.1 Types of drug formulations- 2.1.1 Herbal, inorganic and animal products with examples, 2.1.2 Internal and external medicines with examples. 2.1.3 Raw material to finished product— 2.1.3.1 Solid preparations- with two examples 2.1.3.2 Liquid preparations- with two examples 2.1.3.3 Gaseous preparations- with two examples		
Unit- III:	Unani system of Medicine: 3.1 History, objectives, basic principles of Unani medicine system. 3.2 Maintenance of health, the concept of disease, concept of sabab, marz and arz, diagnosis and treatment Sources of drugs- plants, animals and minerals 3.3 Types of drug formulations 3.3.1 Solid preparations 3.3.2 Semisolid preparations 3.3.3 Liquid preparations 3.3.4 Gaseous preparations		
Unit- IV:	Unani Medicine (Manufacturing and case study): 4.1 Methods of manufacture- raw material to finished product- 4.2 Manufacturing of Hab, Qurs, Sufoof and Majoon. 4.3 Study of a disease and its treatment with Unani system of medicine, example-Asthama.		
Unit- V:	Tibetan System of Medicine: 5.1 Historical Account (Sowa Rigpa) 5.2 Theory of three factors 5.3 Principles of Tibetan Medicine 5.4 Major Formulation Types in the Tibetan medicine system		
Unit- VI	Trends and utility: 6.1 Current trends and applications of Siddha medicines 6.2 Current trends and applications of Unani medicine 6.3 Current trends and Applications of Tibetan medicine		
Practicals- Indian Systems of Medicine- II (Siddha, Unani and Tibetan) 1) Preparation & Characterization of a Siddha formulation (Any 3 examples) 2) Preparation & Characterization of an Unani formulation (Any 3 examples) 3) Preparation & Characterization of Tibetan medicine formulation (Any 3 examples)			
Suggested Reading:			
Farooqui, M. I. H. (2017) Plants in Ayurveda and Unani Medicine.			

Forde, R. Q. (2008) The book of Tibetan Medicine : How to use Tibetan healing for personal wellbeing. Octopus Publishing Group.
 Hakim, C. and Gyatso, T. (2015) Essentials of Tibetan Traditional Medicine, North Atlantic Disc.
 Kapoor, L. D. (2020) Handbook of Ayurvedic medicinal plants. Herbal reference library.
 Khare, C. P. (2017) Indian Herbal remedies, Rational Western therapy, Ayurvedic and other traditional Uses and Botany, Springer
 National Formulary of Unani Medicine (2010) Published by AYUSH
 Palpandian R., (2019) Siddhas: Masters of Nature, Devotees of Shri Shri Ravishankar Ashram
 Ramchandran, J (2005) Herbs of Siddha Medicine. Murugan Siddha publication
 Salima Akhtar et al., (2021) Alternative medicine: a recent review. Chapter, IntechOpne
 Sen, Saikat, and Chakraborty R. (2021) Herbal Medicine in India, Indigenous knowledge, practice, innovation, and values. Springer publication.
 Thottam, P. J. (2012) Siddha medicine: Handbook of traditional remedies, Thottam Publisher.
 Unwan M et al., (2022) The textbook of Moalajat: Master the Unani Medicine with confidence. Notion Press India

Learning Outcomes:

- The students will acquire knowledge about different alternative medicine,
- The students will skilled in preparing Siddha, Unani and Tibetan formulation,

M. Sc. II, Semester- IV (Herbal Science)

Practical: XIV/ Lab- XIV

Indian System of Medicine-II (Siddha, Unani and Tibetan) (DSC II.4)

(2 hrs/ week; Credits= 01)

Time: 3.00 Hrs]

[Total Marks: 50

(Internal: 25 Marks and External: 25 marks)

Internal Practical Examination:

4. Overall performance	10 M
5. Report of visit to any National Institute/ Industry/Assignment/Survey	10 M
6. Attendance	05 M
Total	25 M

External Practical Examination:

1. To prepare any two Siddha samples	10 M
2. Preparation of Unani sample	05 M
3. <i>Viva- voce</i>	05 M
4. Practical record submission	05 M
Total	25 M

M. Sc. Herbal Science		Semester-IV	
Code of the Course Subject	Title of the Course/ Subject	No. of Periods/week	
DSC III.4	Medicinal Plants -Case Studies	03 Credits = 03	
COs :			
<ul style="list-style-type: none"> • Students will be able to identify various human diseases and disorders and acquire knowledge about the medicinal plants responsible for specific disorders. • Students will be able to analyze different formulations available in the local market. • Students will understand the basic factors use in herbal formulation. 			
Unit: I:	Medicinal Plants Against Disorders and Diseases- I: 1.1 Phytoconstituents and mode of action of medicinal plants used against the following Disorders: 1.1.1 Cold,Cough, Fever 1.1.2 Asthma and skin problems 1.1.3 Gynecological Disorders 1.1.4 Rheumatism and Arthritis		
Unit- II:	Medicinal Plants Against Disorders and Diseases -II 2.1 Phytoconstituents and mode of action of medicinal plants used against the following Disorders: 2.1.1 Cardiac 2.1.2 Diabetes 2.1.3 Gastrointestinal disorders 2.1.4 Liver disorders		
Unit- III:	Herbal Tinctures and Formulations: 3.1 Commercial production of herbal tinctures and herbal extracts by using Solvents of different polarity. 3.2 Principles of Extraction, Selection of solvent, Solid Phase Extraction (SPE) Super Critical Fluid Extraction (SCFE)		
Unit- IV:	Herbal Tinctures and Formulations: 4.1 Herbal formulations for: 4.1.1 Medicated Powders 4.1.2Medicated Oils 4.1.3Toiletries		
Unit- V:	Herbal Drug Design and Efficacy: 5.1 Principles and practice, 5.2 Evolution of new drug molecule, steps involved in designing a drug molecule, 5.3 Drug formulation, 5.4 Efficacy testing.		
Unit- VI	Drug candidates from plants: 1. Andrographolides from <i>Andrographis paniculata</i> 2. Bacosides from <i>Bacopa monnieri</i> 3. Berberine from <i>Berberis aristata</i>		
Practical: Medicinal Plants as Pharma Resource 1) Preparation of Monographs of Medicinal Plants (any five) 2) Preliminary phytochemistry of medicinal plants (any five) 3) Demonstration of herbal extraction methods.			
Suggested Reading:			
Agrawal, N. and Sharma, N. (2020) A textbook of Pharmacognosy and Phytochemistry, Vol-I and			

II. R. Narain Publisher and Distributor.
 Bhattacharya, S. K. (2020) Handbook of Medicinal Plants. Pointer Publisher.
 Kalia, A. N. (2016) Text Book of Pharmacognosy and Phytochemistry, Vol. I, CBS Publication
 Kapoor, L. D. (2020) Handbook of Ayurvedic medicinal plants. Herbal reference library.
 Khare, C. P. (2017) Indian Herbal remedies, Rational Western therapy, Ayurvedic and other traditional Uses and Botany, Springer
 Rangari, V. D. (2015) Pharmacognosy and phytochemistry, Volume- I, Career Publication, India
 Rangari, V. D. (2015) Pharmacognosy and phytochemistry, Volume- II, Career Publication, India
 Sen, Saikat, and Chakraborty R. (2021) Herbal Medicine in India, Indigenous knowledge, practice, innovation, and values. Springer publication.
 Sherma, J. and Bernard, F. (2010) Handbook of Thin layer chromatography, Third Edition, Revised and Expanded.
 Shukla P, K., and Gupta, P. K. (2020) A practical book of Pharmacognosy and Phytochemistry Vol- 1 & 2, Nirali Publication
 Srivastava, H. C. (2018) Medicinal and Aromatic plants (ICAR, New Delhi)
 Tondon, N. and Sharma, P. (2012) Quality standard of Indian medicinal plants Vol. 1-10. Vedam Books, India
 Touchstone, J. C. (1983) Practice of Thin layer chromatography, Wiley and Sons
 Trivedi, P. C. (2018) Herbal Drugs and Biotechnology, Avishkar Publisher and Distributors.

Learning Outcomes:

- Students will acquire knowledge about medicinal plants used against specific diseases or disorders.
- Students will become expert in the formulation of herbal tinctures.

M. Sc. II, Semester- IV (Herbal Science)
Practical: XV/ Lab- XV
Medicinal Plants: Case Studies (DSC III.4)
(2 hrs/ week; Credits= 01)

Time: 3.00 Hrs]

[Total Marks: 50
(Internal: 25 Marks and External: 25 marks)

Internal Practical Examination:

7. Overall performance	10 M
8. Report of visit to any National Institute/ Industry/Assignment/Survey	10 M
9. Attendance	05 M
Total	25 M

External Practical Examination:

1. Monograph of any two medicinal plants	10 M
2. Preliminary phytochemistry of given plant sample	05 M
3. <i>Viva- voce</i>	05 M
4. Practical record submission	05 M
Total	25 M

Syllabus Prescribed for the year 2024-25		
Programme M. Sc. Herbal Science	PG Programme Semester-IV	
Code of the Course Subject DSE IV	Title of the Course/ Subject Phytochemistry and Pharmacognosy	No. of Periods/week 03 Credits = 03
COs :		
<ol style="list-style-type: none"> To expose the students to various modern techniques used for plant authentication. To impart analytical skills to students. To make the students to analyze and interpret the results with accuracy. 		
Unit: I:	<ul style="list-style-type: none"> Chromatography <ol style="list-style-type: none"> 1.1 Introduction to Chromatography techniques 1.2 Overview of various types of Chromatography techniques. 1.3 Paper chromatography, Thin layer chromatography, Liquid chromatography 	
Unit- II:	<ul style="list-style-type: none"> Chromatography <ol style="list-style-type: none"> Principles, Instrumentation, processes, applications of – <ol style="list-style-type: none"> HPTLC, GC and Gas-liquid chromatography, Affinity Chromatography 	
Unit- III:	<ul style="list-style-type: none"> Electrophoresis: <ol style="list-style-type: none"> Principles of Electrophoresis, Agarose Gel Electrophoresis and PAGE Basic protein chemistry, Principle of separation and electro-focusing. 	
Unit- IV:	<ul style="list-style-type: none"> Spectroscopy: Principle, working and applications of- <ol style="list-style-type: none"> UV and Visible spectrophotometer, Turbidometry, IR, MS 	
Unit- V:	Spectroscopy: Principle, working and applications of- <ol style="list-style-type: none"> AAA NMR X-ray diffractometry 	
Unit- VI:	<ul style="list-style-type: none"> Techniques in plant authentication <ol style="list-style-type: none"> Role of chromatography and spectroscopy in plant authentication (Chemotaxonomic approach) Role of electrophoresis and DNA barcoding/ sequencing in plant authentication (Genomic approach) 	
Laboratory Exercises:		
<ol style="list-style-type: none"> Sample preparation, processing and Separation of Phytochemicals using different methods of Chromatography <ul style="list-style-type: none"> Paper Chromatography Thin Layer Chromatograph, Liquid Chromatography Column chromatography. Extraction and separation of Proteins from the given raw material/products using PAGE. Extraction and separation of Nucleic acid by Gel electrophoresis. Principles, working, and applications of UV and Visible spectrophotometer. Principles, working, and applications of IR Spectroscopy. Principal, working, and applications of XRD. 		
Suggested Reading:		
Mark, F. Vitha (2016) Chromatography: Principles and Instrumentation, Wiley Publication.		

McNair, H. M. and Miller, J. M. (2009) Basic Gas Chromatography, Wiley- Blackwell Publisher.
 Scott, R. P. W. (1995) Techniques and Practice of Chromatography, CRC Press
 Nikalje, A. P. and Bhosale, D. (2017) A Handbook of Chromatography, Scholars Press, Germany.
 Robards, K., Haddad, P. R. and Jackson, P. E. (1994) Principles and Practice of Modern Chromatographic Methods. Elsevier Ltd.
 Sharma, J. and Fried, B. (2003) Edn. Handbook of Thin-Layer Chromatography Third Edition, Revised and Expanded. Marcel Decker, Inc.
 Coskun, O. (2016) Separation techniques: Chromatography. North Clinic.Instamb. 3(2): 156- 160
 Mitchell, G. H. (2017) Gel electrophoresis: Types, Applications and Research, Nova Science Publishers Inc.
 Westernmier, R. (2004) Electrophoresis in practice: A guide to methods and applications of DNA and Protein separation, Wiley VCH Publisher
 Magdeldin, Sameh (2012) Gel electrophoresis: Principles and Basics, Open access –Peer reviewed edited volume, IntechOpen
 Bier, M. (2013) Electrophoresis: Theory, method, and applications. Elsevier Publication
 Kafle, B. P. (2019) Chemical analysis and material characterization by spectrophotometry, Elsevier Inc.
 Heinz- Helmut, P. (1992) UV- Visible spectroscopy and its applications. Springer Ltd.
 Mark, F. Vitha (2018) Spectroscopy: Principles and Instrumentation. John Wiley & Sons Inc.

Learning Outcomes:

1. The students will learn about the principles, working, and applications of various analytical techniques including chromatography, spectroscopy, and electrophoresis.
2. The students will acquire the skill of handling various instruments at the laboratory level.
3. The students will be acquainted with various plant authentication techniques.
4. The students could analyze the samples and interpret the results with accuracy.

M. Sc. II, Semester- IV (Herbal Science)
Practical: XV/ Lab- XV
Phytochemistry and Pharmacognosy (DSE- IV)
(2 hrs/ week; Credits= 01)

Time: 3.00 Hrs]

[Total Marks: 50
(Internal: 25 Marks and External: 25 marks)

Internal Practical Examination:

10. Overall performance	10 M
11. Report of visit to any National Institute/ Industry/Assignment/Survey	10 M
12. Attendance	05 M
Total	25 M

External Practical Examination:

1. Separation of compounds using Paper chromatography/ TLC/ LC	10 M
2. Principle, working and applications of any one major instrument	05 M
3. <i>Viva- voce</i>	05 M
4. Practical record submission	05 M
Total	25 M

Programme M. Sc. Herbal Science Code of the Course Subject DSE IV	PG Programme Semester-IV Title of the Course/ Subject Herbal Drug Technology	No. of Periods/week 03 Credits = 03
COs : 1. To expose the students to various modern techniques used for plant authentication. 2. To impart analytical skills to students. 3. To make the students analyze and interpret the results with accuracy.		
Unit: I:	<ul style="list-style-type: none"> • Chromatography 1.1 Introduction to chromatography techniques and its types 1.2 Principles, Instrumentation, processes, applications of – 1.2.1 Paper Chromatography (PC), 1.2.2 Thin Layer Chromatography (TLC) 1.2.3 Liquid Chromatography (LC) 	
Unit- II:	<ul style="list-style-type: none"> • Chromatography Principles, Instrumentation, processes, applications of – 1.1 HPTLC, 1.2 HPLC 1.3 Gas Chromatography (GC) 	
Unit- III:	<ul style="list-style-type: none"> • Spectroscopy: Principle, working, and applications of- 12.1 UV and Visible spectrophotometer, 12.2 Turbidometry, 12.3 IR, 	
Unit- IV:	<ul style="list-style-type: none"> • Spectroscopy: Principle, working and applications of- 4.2 AAA 4.2 NMR 4.3 X-ray diffractometry 	
Unit- V:	<ul style="list-style-type: none"> • Advanced Analytical techniques 5.1 LC- MS 5.2 GC- MS 5.3 LC-NMR- MS 	
Unit- VI:	<ul style="list-style-type: none"> • Techniques in plant authentication 6.1 Explain role of chromatography and spectroscopy in plant authentication (Chemotaxonomic approach) and drug development 6.2 Explain role of electrophoresis and DNA barcoding/ sequencing in plant authentication (Genomic approach) and drug development 	
Laboratory Exercise:		
1. Sample preparation, Processing and Separation of Phytochemicals using different methods of Chromatography - Paper Chromatography - Thin Layer Chromatograph, - Liquid Chromatography 2. Principles, working, and applications of UV and Visible spectrophotometer. 3. Principles, working and applications of HPTLC/ HPLC. 3. Principles, working, and applications of IR Spectroscopy. 4. Principal, working, and applications of XRD.		
Suggested Reading:		
Mark, F. Vitha (2016) Chromatography: Principles and Instrumentation, Wiley Publication. McNair, H. M. and Miller, J. M. (2009) Basic Gas Chromatography, Wiley- Blackwell Publisher. Scott, R. P. W. (1995) Techniques and Practice of Chromatography, CRC Press Nikalje, A. P. and Bhosale, D. (2017) A Handbook of Chromatography, Scholars Press, Germany.		

Robards, K., Haddad, P. R. and Jackson, P. E. (1994) Principles and Practice of Modern Chromatographic Methods. Elsevier Ltd.

Sharma, J. and Fried, B. (2003) Edn. Handbook of Thin-Layer Chromatography Third Edition, Revised and Expanded. Marcel Decker, Inc.

Coskun, O. (2016) Separation techniques: Chromatography. North Clinic.Instamb. 3(2): 156- 160

Mitchell, G. H. (2017) Gel electrophoresis: Types, Applications and Research, Nova Science Publishers Inc.

Westermier, R. (2004) Electrophoresis in practice: A guide to methods and applications of DNA and Protein separation, Wiley VCH Publisher

Magdeldin, Sameh (2012) Gel electrophoresis: Principles and Basics, Open access –Peer reviewed edited volume, IntechOpen

Bier, M. (2013) Electrophoresis: Theory, method, and applications. Elsevier Publication

Kafle, B. P. (2019) Chemical analysis and material characterization by spectrophotometry, Elsevier Inc.

Heinz- Helmut, P. (1992) UV- Visible spectroscopy and its applications. Springer Ltd.

Mark, F. Vitha (2018) Spectroscopy: Principles and Instrumentation. John Wiley & Sons Inc.

Learning Outcomes:

1. The students will learn about the principles, working, and applications of various analytical techniques including chromatography, spectroscopy, and electrophoresis.
2. The students will acquire the skill of handling various instruments at the laboratory level.
3. The students will be acquainted with various plant authentication techniques.
4. The students could analyze the samples and interpret the results with accuracy.

M. Sc. II, Semester- IV (Herbal Science)

Practical: XV/ Lab- XV

Phytochemistry and Pharmacognosy (DSE- IV)

(2 hrs/ week; Credits= 01)

Time: 3.00 Hrs]

[Total Marks: 50

(Internal: 25 Marks and External: 25 marks)

Internal Practical Examination:

1. Overall Performance	05 M
2. Visit to any National Institute/ Industry	10 M
3. Assignment	05 M
4. Attendance	05 M
Total	25 M

External Practical Examination:

1. Separation of compounds using Paper chromatography/ TLC/ LC	10 M
2. Principle, working and applications of any one major instrument	05 M
3. <i>Viva- voce</i>	05 M
4. Practical record submission	05 M
Total	25 M