

	<p>A project supported along with photographs taken during field study to be submitted giving comprehensive idea about different types of inflorescence, flowers and fruits/ At least three field excursions at hills/Oceans/Deserts including one Compulsory excursion to Botanical Garden, FRI/BSI and Central National Herbarium (CNH). Central Research Institutes/Hot Spots</p>	
Programme /Class: <b>Diploma in Plant Identification, Utilization &amp; Ethnomedicine</b>	Year: <b>II</b>	Semester: <b>IV Paper-I</b>
Subject: <b>Botany</b>		
Course Code: B040401T	Course Title: <b>Economic Botany, Ethnomedicine and Phytochemistry</b>	
<p><b>Course outcomes:</b> After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand about the uses of plants –will know one plant-one employment</li> <li>2. Understand phytochemical analysis related to medicinally important plants and economic products produced by the plants</li> <li>3. know about the importance of Medicinal plants and its useful parts, economically important plants in our daily life and also about the traditional medicines and herbs, and its relevance in modern times.</li> </ol>		
Credits: <b>4</b>		<b>Core Compulsory</b>
Max. Marks: <b>25+75</b>		Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): <b>4-0-0</b>		
Unit	Topic	No. of Lectures (60hrs)
<b>I</b>	<p><b>Origin and domestication of cultivated plants</b> Centers of diversity of plants, origin of crop plants. Domestication and introduction of crop plants. Concepts of sustainable development; cultivation, production and uses of Cereals, legumes, Spices &amp; beverages.</p>	<b>7</b>
<b>II</b>	<p><b>Botany of oils, Fibers, timber yielding plants &amp; dyes</b> Study of the plants with Botanical names, Family, part used, and economic uses yielding Edible &amp; essential oils; Sugar, Starch; Fibers; Paper, Fumitories &amp; Masticatories, Rubber, Dyes, Timber, biofuel crops.</p>	<b>7</b>
<b>III</b>	<p><b>Commercial production of Flowers, Vegetables, and fruits (To be Chosen area wise)</b> Commercial greenhouse cultivation of rose, Gerbera, Gladiolus, Anthurium/lilium/lily, tomato, bell pepper, cucumber, strawberry &amp; Exotic leafy vegetables using Hydroponics.</p>	<b>7</b>
<b>IV</b>	<p><b>IPR &amp; Traditional Knowledge</b> IPR and WTO (TRIPS, WIPO), Patent Act 1970 and its amendments, TIFAC, NRDC, Rights, Procedure of obtaining patents, Working of patents, Infringement, Copyrights, Trademarks, Geographical Indications, Traditional Knowledge Digital Library, Protection of Traditional Knowledge &amp; Protection of Plant Varieties and Biotech inventions.</p>	<b>8</b>
<b>V</b>	<p><b>Ethnobotany</b> Methodologies of ethnobotanical research: Field work, Literature, Herbaria and Musea and other aspects of ethnobotany. Importance of ethnobotany in Indian systems of medicine (Siddha, Ayurveda and Unani), Role of AYUSH, NMPB, CI-MAP and CARI. Tribal knowledge towards disease diagnosis, treatment, medicinal plants, plant conservation and cultivation.</p>	<b>8</b>
<b>VI</b>	<p><b>Medicinal aspects</b> Study of common plants used by tribes (<i>Aegle marmelos</i>, <i>Ficus religiosa</i>, <i>Cynodon dactylon</i>, <i>Eclipta alba</i>, <i>Oxalis</i>, <i>Ocimum sanctum</i> and <i>Trichopus zeylanicus</i>) Ethnobotanical aspect of conservation and management of plant resources, Preservation of primeval forests in the form of sacred groves of individual species and Botanical uses depicted in our epics.</p>	<b>8</b>

	Plants in primary health care: common medicinal plants: <i>Tinospora, Acorus, Ocimum, Turmeric</i> and <i>Aloe</i> . Indian Pharmacopeia, Quality Evaluation of crude drugs & adulteration	
<b>VII</b>	<b>Pharmacognosy</b> Preparation of drugs for commercial market - Organoleptic evaluation of drugs - Microscopic evaluation of drugs - Physical evaluation of drugs - Active and inert constituents of drugs - Classification of drug plants - individual drugs - drug adulteration. Sources of crude drugs – roots, rhizome, bulb, corm, leaves, stems, flowers, fruits and seeds ; organoleptic study of <i>Adhatoda vasica, Andrographis paniculata, Azadirachta indica, Coriandrum sativum, Datura metel, Eclipta alba, Emblica officinalis, Ocimum sanctum, Phyllanthus amarus, Ricinus communis, Vinca rosea</i> and <i>Zingiber officinale</i> .	<b>8</b>
<b>VIII</b>	<b>Herbal Preparations &amp; Phytochemistry :</b> Collection of wild herbs - Capsules - compresses - Elixirs - Glycerites - Hydrotherapy or Herbal bath - Herbal oils - Liquid extracts or Tincture - Poultices - Salves - Slippery elm slurry and gruel - Suppositories - Teas. Plant natural products , general detection, extraction and characterization procedures. Glycosides and Flavonoids and therapeutic applications. Anthocyanins and Coumarins and therapeutic applications, Lignans, Terpenes, Volatile oils and Saponins, Carotenoids and Alkaloids Carotenoids and pharmacological activities.	<b>7</b>

**Suggested Readings:**

**Course Books published in Hindi may be prescribed by the Universities.**

1. [REDACTED] [REDACTED] [REDACTED] ( [REDACTED] [REDACTED] , [REDACTED] , [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] ) [REDACTED] - [REDACTED] , [REDACTED] [REDACTED] [REDACTED] [REDACTED] : [REDACTED] [REDACTED] , [REDACTED]
2. [REDACTED] [REDACTED] [REDACTED] , [REDACTED] [REDACTED] [REDACTED] भवन [REDACTED] . कस [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
3. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] - Dhankar - Sharma – Trivedi
4. Aushdhiye Poudhe (Hindi) by R.P. Sharma | 1 January 2013 YKING BOOKS

1. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.
2. Sambamurthy, AVSS & Subrahmanyam, NS (2000). Economic Botany of Crop Plants. Asiotech Publishers. New Delhi.
3. Singh, D.K and K.V. Peter. 2014. Protected cultivation of horticultural crops. New India Publishing Agency, India.
4. Reddy P. Parvatha. 2016. Sustainable crop protection under protected cultivation. Springer, Singapore.
5. Amit Deogirikar. 2019. A Text Book on Protected Cultivation and Secondary Agriculture. Rajlaxmi Prakashan, Aurangabad, India.
6. Singh, B., B. Singh, N. Sabir and M Hasan. 2014. Advances in protected cultivation. New India Publishing Agency, India.
7. Sharma, OP. 1996. Hill's Economic Botany (Late Dr. AF Hill, adopted by OP Sharma). Tata McGraw Hill Co. Ltd., New Delhi.
8. Joe J. Hanan. 1997. Greenhouses: Advanced Technology for protected horticulture. CRC Press.
9. Krishnamurthy, K.V. (2004). An Advanced Text rbook of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi
10. N.K. Acharya: Textbook on intellectual property rights, Asia Law House (2001).
11. Manjula Guru & M.B. Rao, Understanding Trips: Managing Knowledge in Developing Countries, Sage Publications (2003).
12. P. Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy, Tata McGraw-Hill (2001).
13. Arthur Raphael Miller, Micheal H.Davis; Intellectual Property: Patents, Trademarks and Copyright in a Nutshell, West Group Publishers (2000).
14. Jayashree Watal, Intellectual property rights in the WTO and developing countries, Oxford University Press, Oxford.
15. Jain, S. K. and V. Mudgal. 1999. A Handbook of Ethnobotany. Bishen Singh Mahendra Pal Singh, Dehradun.
16. Jeffrey, C. 1982. An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge. London.
17. Joshi, S. G. 2000. Medicinal Plants. Oxford and IBH, New Delhi.
18. Kokate, C. and Gokeale- Pharmacognosy- Nirali Prakashan, New Delhi.
19. Lad, V. 1984. Ayurveda – The Science of Self-healing. Motilal Banarasidass, New Delhi.
20. Lewis, W. H. and M. P. F. Elwin Lewis. 1976. Medical Botany. Plants Affecting Man's Health. A  
a. Wiley Inter science Publication. John Wiley and Sons, New York.
21. Farooqui, A. A. and Sreeraman, B. S. 2001. Cultivation of medicinal and aromatic crops. Universities Press.
22. Harborne, J. B. 1998. Phytochemical methods – a guide to modern techniques of plant analysis 3 rd edition, Chapman and Hall.
23. Yesodha, D., Geetha, S and Radhakrishnan, V. 1997. Allied Biochemistry. Morgan publications, Chennai. I. Gurdeep Chatwal, 1980. Organic chemistry of natural productis. Vol. I. Himalaya Publishing house.
24. Kalsi, P. S. and Jagtap, S., 2012. Pharmaceutical medicinal and natural product chemistry. N.K. Mehra for Narosa Publishing House Pvt. Ltd. New Delhi.
25. Wallis, T. E. 1946. Text book of Pharmacognosy, J & A Churchill Ltd.

26. Roseline, A. 2011. Pharmacognosy. MJP Publishers, Chennai.
27. Jain S. K. 1989. Methods and approaches in Ethnobotany, Society of Ethnobotanists, Lucknow.
28. Sharol Tilgner, N. D. 1999. Herbal medicine - From the heart of the earth. Edn. 1, Printed in the USA by Malloy Lithographing Inc.
29. Pal, D.C. & Jain, S.K., 1998. Tribal Medicine. Naya Prakash Publishers, Calcutta.
30. Datta & Mukerji, 1952. Pharmacognosy of Indian roots of Rhizoms drugs. Bulletin No.1 Ministry of Health, Govt. of India.
31. Young Ken, H.W., 1948. Text Book of Pharmacognosy. Blakiston C., Philadelphia.
32. Shukla, R.S., 2000. Forestry for tribal development. A.H. Wheeler & Co. Ltd., India.
33. Raychudhuri, S.P., 1991. (Ed.) Recent advances in Medicinal aromatic and spice crops. Vol.1, Today & Tomorrow's printers and publishers, New Delhi.
34. Bajpai, P.K. 2006. Biological Instrumentation and methodology. S. Chand & Co. Ltd.
35. K. Wilson and J. Walker Eds. 2005. Biochemistry and Molecular Biology. Cambridge University Press.
36. k. Wilson and KH Goulding. 1986. Principles and techniques of Practical Biochemistry. (3 edn Edward Arnold, London.

**This course can be opted as an elective by the students of following subjects: Open to all but special for B.Sc. Biotech, B.Sc. Forestry, B.Sc. Agriculture, B. Pharma, B.A. (Curators), B.A. Archaeology, B.A. Geology, BAMS**

**Suggested Continuous Evaluation Methods:**

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:

Internal Assessment	Marks
Class Interaction	5
Quiz	5
Seminar	7
Assignment (Charts/ Flora/ Rural Service/ Technology Dissemination)	8
	<b>25</b>

**Course prerequisites:**

**Qualification:** To study this course, a student must have qualified 10+2 with Biology/ NSQF level 3 from Sector Skill Councils / Diploma holder from ITI in (Biology/ Agriculture/ Forestry).

**Facilities: Smart and Interactive Class**

**Other Requisites: : Video collection, Books, CDs, Flora, Herbarium, Access to On-line resources, Display Charts**

**Suggested equivalent online resources:**

[https://www.pnas.org/content/104/suppl\\_1/8641](https://www.pnas.org/content/104/suppl_1/8641)

<https://www.journals.uchicago.edu/doi/pdfplus/10.1086/659998>

<https://bsi.gov.in/page/en/ethnobotany>

<http://www.legalserviceindia.com/article/198-Intellectual-Property-and-Traditional-knowledge.html>

[https://www.brainkart.com/article/Economic-importance-Plants---Food,-Rice,-Oil,-Fibre,-Timber-yielding-plant\\_1095/](https://www.brainkart.com/article/Economic-importance-Plants---Food,-Rice,-Oil,-Fibre,-Timber-yielding-plant_1095/)

<https://www.loc.gov/rr/scitech/tracer-bullets/economic-botanytb.html>

<http://nsdl.niscair.res.in/bitstream/123456789/127/1/Fibre%20crops%2C%20bamboo%2C%20timber%20-%20Final.pdf>

<https://www2.palomar.edu/users/warmstrong/econpls.htm>

<https://www.longdom.org/proceedings/phytochemistry-and-phytoconstituents-of-herbal-drugs-and-formulations-1668.htm>

Programme: <b>Diploma in Plant Identification, Utilization &amp; Ethnomedicine</b>		Year: <b>II</b>	Semester: <b>IV Paper-II</b>
Subject: <b>Botany</b>			
Course Code: B040402P		Course Title: <b>Commercial Botany &amp; Phytochemical Analysis</b>	
<b>Course outcomes:</b> After the completion of the course the students will be able to: <ol style="list-style-type: none"> <li>1. Know about the commercial products produced from plants.</li> <li>2. Gain the knowledge about cultivation practices of some economic crops.</li> <li>3. Understand about the ethnobotanical details of plants.</li> <li>4. Learn about the chemistry of plants &amp; herbal preparations</li> <li>5. Can become a protected cultivator, aromatic oil producer, Pharmacologist or quality analyst in drug company.</li> </ol>			
Credits: <b>2</b>		<b>Core Compulsory</b>	
Max. Marks: <b>25+75</b>		Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): <b>0-0-2</b>			
Unit	Topic  (Perform minimum any three experiments from each unit)	No. of Lectures (60hrs)	
<b>I</b>	<b>Economic Botany &amp; Microtechnique:</b> Cereals: Wheat (habit sketch, L.S./T.S. of grain, starch grains, micro-chemical tests); rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests) Legume: Pea or ground nut (habit, fruit, seed structure, micro-chemical tests) Source of sugars and starches: Sugarcane (habit sketch; cane juice- micro-chemical tests); potato (habit sketch, tuber morphology, T.S. of tuber to show localization of starch grains, W.M. of starch) grains, micro-chemical tests. Tea- tea leaves, tests for tannin Mustard- plant specimen, seeds, tests for fat in crushed seeds Timbers: section of young stem. Jute- specimen, transverse section of stem, tests for lignin on T.S. of stem and study of fiber following maceration technique. Study of specimens of economic importance mentioned in Unit I-& II	<b>8</b>	
<b>II</b>	<b>Commercial Cultivation</b> Field visit to Green houses for understanding Floriculture & vegetables production Development of hydroponics nutrient solutions & running models for cultivation of vegetables Development of hydroponics nutrient solutions & running models for cultivation of fodder	<b>8</b>	
<b>III</b>	<b>Cultivating Medicinal and aromatic plants &amp; Essential oil extraction</b> a. Lemon grass/ Neem/ Zinger /Rose/Mint	<b>7</b>	
<b>IV</b>	<b>Documentation from</b> Traditional Knowledge Digital Library, Mark the Geographic Indications on Map, Understand –Nakshtra Vatika, Navgrah vatika and develop in your college To extract the names of the plants and Botanical uses depicted in our epics. Visit NISCAIR, New Delhi	<b>7</b>	
<b>V</b>	<b>Ethnobotany</b> Study of common plants used by tribes. <i>Aegle marmelos</i> , <i>Ficus religiosa</i> , <i>Cynodon dactylon</i> . Visit a tribal area and collect information on their traditional method of treatment using crude drugs. Familiarize with at least 5 folk medicines and study the cultivation, extraction and its medicinal application. Observe the plants of ethnobotanical importance in your area. Visit to an Ayurveda college or Ayurvedic Research Institute / Hospital	<b>7</b>	

<b>VI</b>	<b>Instrumentation and herbal Preparations</b> Develop Capsules of herbs/ Develop Herbal oils/ Develop Poultice/cream Analyse some active ingredients using chromatography /Spectrophotometry	<b>8</b>
<b>VII</b>	<b>Pharmacognosy</b> Organoleptic studies of plants mentioned in the theory : 1. Morphological studies of vegetative and floral parts. 2. Microscopic preparations of root, stem and leaf. 3. Stomatal number and stomatal index. 4. Vein islet number. 5. Palisade ratio. 6. Fibres and vessels (maceration). 7. Starch test 8. Proteins and lipid test	<b>8</b>
<b>VIII</b>	<b>Phytochemistry:</b> Determination of the percentage of foreign leaf in a drug composed of a mixture of leaves. Dimensions of Calcium oxalate crystals in powdered crude drug. Preliminary phytochemical tests for alkaloids, terpenoids, glycosides, volatile oils, tannins & resins. Any 5 herbal preparations.	<b>7</b>

**Suggested Readings:** *Course Books published in Hindi may be prescribed by the Universities.*

1. Plant Ecology And Economic Botany by Dhankar - Sharma - Trivedi, RBD Publication
2. [Shiva Kant, Pankaj Kumar Brahmiya](#) : Thakur Publication
3. PHARMACOGNOSY ...Hindi Edition (Paperback, Hindi, Dr. Akancha Rashi, KHUSHAL JASWANI), RM Publication
4. [Pharmacognosy ...Hindi Edition \(Paperback, Hindi, Dr. Akancha Rashi, KHUSHAL JASWANI\), RM Publication](#)

1. Wallis, T. E. 1946. Textbook of Pharmacognosy, J & A Churchill Ltd.
2. Roseline, A. 2011. Pharmacognosy. MJP Publishers, Chennai.
3. Jain S. K. 1989. Methods and approaches in Ethnobotany, Society of Ethnobotanists, Lucknow.
4. Pal, D.C. & Jain, S.K., 1998. Tribal Medicine. Naya Prakash Publishers, Calcutta.
5. Datta & Mukerji, 1952. Pharmacognosy of Indian roots of Rhizome drugs. Bulletin No.1 Ministry of Health, Govt. of India.
6. Young Ken, H.W., 1948. Text Book of Pharmacognosy. Blakiston C., Philadelphia.
7. Shukla, R.S., 2000. Forestry for tribal development. A.H. Wheeler & Co. Ltd., India.
8. Raychudhuri, S.P., 1991. (Ed.) Recent advances in Medicinal aromatic and spice crops. Vol.1, Today & Tomorrow's printers and publishers, New Delhi.
9. Khasim S.M Botanical Microtechniques: Principles and Practice-
10. Sambamurthy, AVSS & Subrahmanyam, NS (2000). Economic Botany of Crop Plants. Asiatech Publishers. New Delhi.
11. Singh, D.K and K.V. Peter. 2014. Protected cultivation of horticultural crops. New India Publishing Agency

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Assignment (Charts/ Flora/ Rural Service/ Technology Dissemination)	8
	<b>25</b>

	<p><b>Course prerequisites:</b>  <b>Qualification:</b> To study this course, a student must have qualified 10+2 with Biology/ NSQF level 3 from Sector Skill Councils / Diploma holder from ITI in (Biology/ Agriculture/ Forestry).  <b>Facilities: Smart and Interactive Class</b>  <b>Other Requisites:</b> Video collection, Books, CDs, Flora, Herbarium, Access to On-line resources, Display Charts  <b>Lab requisites:</b> Repository of economic products, Microscopes/ Botanical /Herbal Garden, TLC, Spectrophotometer.</p>
	<p>Suggested equivalent online courses:  <a href="https://www.entrepreneurindia.co/Document/Download/pdfanddoc-144615-.pdf">https://www.entrepreneurindia.co/Document/Download/pdfanddoc-144615-.pdf</a>  <a href="http://nopr.niscair.res.in/handle/123456789/45825">http://nopr.niscair.res.in/handle/123456789/45825</a>  <a href="https://www.wipo.int/export/sites/www/tk/en/resources/pdf/medical_tk.pdf">https://www.wipo.int/export/sites/www/tk/en/resources/pdf/medical_tk.pdf</a>  <a href="https://www.bentoli.com/commercial-farming-agriculture/">https://www.bentoli.com/commercial-farming-agriculture/</a></p>