BTOE 003: APPLICATIONS OF NATURAL PRODUCTS

Course Objective: To develop an understanding of important concepts of natural products, their role in drug development and structure optimization.

Credits: 03 L-T-P-J: 3-0-0-0

Module No.	Course Content	Teaching Hours/ Percentage
I	**Sources of crude drug**: Biological, marine, Mineral and plant tissue culture as source of natural products. Various methods of extraction and isolation of phytopharmaceuticals namely infusion, decoction, maceration, percolation, hot continuous extraction, successive solvent extraction, supercritical fluid extraction, steam distillation, Counter-current Extraction, Ultrasound Extraction (Sonication). Parameters for selection of suitable extraction process.	**10//25%**
II	**Phytochemical Screening:** Screening of alkaloids, saponins, cardenolides and bufadienolides, flavonoids and leucoanthocyanidins, tannins and polyphenols, anthraquinones, cynogenetic glycosides, amino acids in plant extracts. Important therapeutic classes: antimicrobial, antidiabetics, hepatoprotectives, immmunomodulators, anti-cancer.	**10//25%**
III	**Herbal cosmetics:** Importance of herbals as shampoos (soapnut), conditioners and hair darkeners, (amla, henna, hibiscus, tea), skin care (aloe, turmeric, lemon peel, vetiver); Colouring and Flavouring agents from plants; Utilization of aromatic plants and derived products with special reference to sandalwood oil, mentha oil, lemon grass oil, vetiver oil, geranium oil and eucalyptus oil.	**10/25%**
IV	**Nutraceuticals and Health Foods**: Classification of Nutraceuticals, Health foods: Source, Chemical constituents, uses, actions and commercial preparations of, following health foods, Alfalfa, Bran, Angelica, Chamomile, Corn oil, Fenugreek, Ferverfew,	**10/25%**

	Garlic, Ginseng, Ginkgo, Honey, Hops, Safflower oil, Soyabean Oil, Turmeric. Concept and examples of Adaptogens Quality control of herbal drugs as per WHO, AYUSH and Pharmacopoeial guidelines- Extractive values, ash values. Determination of heavy metals, insecticides, pesticides and microbial load in herbal preparations.	

Text Books/ Reference Books:

- Manual K. Lindsey, Plant Tissue Culture, Springer U.K. Wagner.
- Wagner and Bladt, Plant Drug analysis, Springer U.K.
- A.R.Kashi, Industrial Pharmacognosy, Universities press
- S.S.Agrawal, Herbal drug technology, Universities press
- Quality Standards of Indian Medicinal Plants, Vol 10, (ICMR), New Delhi, 2012.
- Indian Herbal Pharmacopoiea, K. M. Varghese Co.Bombay

Course Outcome:

CO1: Ability to explain the origin of drugs from natural sources.

CO2: Ability to explain the role of natural products as the source of many drugs and pharmaceutical ingredients

CO3: Identify some drugs available in the healthcare system that are obtained or sourced from natural products.

CO4: Discuss the processes of standardization of natural products following WHO and other existing guidelines

CO5: Attain Knowledge of the important natural products, their origin, properties and biological activity

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES

	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**L**	**M**	**L**	**L**	**L**	**H**	**M**	**L**	**M**	**M**	**M**
CO2	**H**	**H**	**L**	**L**		**M**		**M**	**M**		**L**	**H**
CO3	**H**	**L**		**L**	**L**		**L**	**L**	**L**	**L**	**M**	**H**
CO4	**L**	**L**	**L**	**M**	**L**			**L**	**M**	**L**	**L**	**L**

CO5	**L**	**L**	**H**	**L**		**L**	**L**	**L**		**M**	**L**	**L**

H = Highly Related; M = Medium; L = Low