

**Aim :** To learn about various bioactive natural products, their extraction, isolation, characterisation and applications

**Course outcomes**

Unit 1- Student will gain a thorough understanding on various sources of natural products

Unit 2 –Student will have a thorough knowledge on various extraction techniques

Unit 3- Student will have a thorough knowledge on separation, purification and characterisation techniques

Unit 4 Student will have an indepth knowledge on methods of structural elucidation

Unit 5 Student will have an overall idea on the various useful natural products from food, spices and toxins

**Unit 1**

**Sources of natural products:** Primary and Secondary Metabolites, Traditional Sources of Natural Products, Sources of Microbes, Venoms and Toxins, A brief account of major classes of secondary metabolites with special reference to plant families such as Zingiberaceae, vitaceae, asteraceae, celastraceae, sapindaceae, moraceae, musaceae, fabaceae, etc : Alkaloids triterpenoids, flavanoids, phenolics and phenolic acids, Steroids, Coumarines, Quinines, Cyanogenic glycosides, Amines and non protein aminoacids, Nutraceuticals and Pharmaceuticals

**Unit 2**

**Extraction of Natural Products:** Water-Steam Distillation, Supercritical Fluid Extraction, Solvent Partitioning , Refined Isolation Techniques and Chromatography, Separations of Nonpolar and polar Compounds, Charcoal, Reverse Phase Resins, High-Performance

**Unit 3**

**Separation, Purification and characterisation techniques-** TLC, HPLC, HPTLC Liquid Chromatography, Capillary Electrophoresis, Polyamide Gel Chromatography, Size-Exclusion Chromatography and GC. Characterization techniques- LC-MS, ID and 2D NMR experiments, Cell culture techniques, NMR, UV-IR, XRay Crystallography, Circular dichroism ,Mass spectrometry

**Unit 4**

**Anti-Infectives from Nature-**Antimicrobial  $\beta$ -Lactams, Structure Elucidation of Penicillin, Isolation of Penicillin, Cephalosporin, Isolation of Cephalosporin C, Isolation of Thienamycin, Antibiotic Macrolides: Erythromycin, Antiparasitic Drugs: Avermectins, Tetracyclines, Terpenes in Human Health.

**Unit 5**

**Natural Products in Food, Spices, and Toxins**

Sweeteners, Xylitol, Aspartame, Sucralose, Stevia, Licorice, Agave ,Spices, Examples of Toxins from Plants, Toxic Mushroom: *Amanita* sp, Marine Toxins from Algae, Marine Toxins: Fish, Spider Venom, Conus Snail Toxins, Poisonous Frogs

### Text Books

1. Natural Products Chemistry- Sources, Separations, and Structures- Raymond Cooper, George Nicola © 2015 by Taylor & Francis Group, LLC, CRC Press
2. Plant-derived Natural Products- Synthesis, Function, and Application- Anne E. Osbourn • Virginia Lanzotti, Springer
3. Bioactive natural products: detection, isolation and structural determination Ed By Sm Colegate & RJ Molyneux, CRC Press, (2007)

### REFERENCES

1. Natural products: Essential resources for human survival, Y. Z. Zhu et al, World Scientific Publishing Co. Pte Ltd, London(2007)
2. Medicinal natural Products: A biosynthetic approach, Paul M. Dewick, John Wiley & Sons(2001)
3. Bioactive natural products: detection, isolation and structural determination Ed By Sm Colegate & RJ Molyneux, CRC Press, (2007)
4. Natural Products Isolation, S D Sarker et al, Humana Press, (2005)
5. Bioactive Compounds from Natural Sources, Second Edition, Corrado Tringali, CRC Press, 2011
6. Chemistry for Pharmacy Students, General, Organic and Natural Product Chemistry, Satyajit D. Sarker University of Ulster, Coleraine, Northern Ireland, UK Lutfun Nahar, University of Ulster, Coleraine, Northern Ireland, UK, John Wiley and Sons, LTD., 2006
7. Chemistry of Natural Products, Sujata V. Bhat, Bhimsen A. Nagasampagi, Meenakshi Sivakumar, First Edition, Springer, Berlin, 2005
8. Trease, G.E. and Evans, W.C.; "Pharmacognosy", W.B. Saunders Publishers, Ltd, 15th ed., 2002.

### SCHEME OF EVALUATION

Sl No.	In- semester assessment		End – semester assessment	
1	Periodical test	30 marks	End Semester Examination	50 mark
2	Assignment	10 marks		
3	Seminar	10 marks		
4	<b>Sub total</b>	<b>50</b>	<b>50</b>	
	<b>Grand total</b>		<b>100</b>	

### ACTIVITIES/ CONTENT WITH DIRECT BEARING ON EMPLOYABILITY/ ENTREPRENEURSHIP/ SKILL DEVELOPMENT (based on NAAC Criteria):

The learner will get a clear understanding of the concepts and ideas regarding the technical and theoretically relevant area which is explored in the course. This course will equip the

learner to build a career as a Faculty in Chemistry, Natural products, Research Scientist in the respective field, Analyst in Industry