Approval: 9th Senate Meeting

Course Name: Practical Metabolomics

Course Number: BY 508

Credit: 1-0-2-3

Prerequisites: Any MS/MSc/PhD students from Basic Sciences. BTech students with IC 136 course (Understanding Biotechnology & its Applications) or Consent of Faculty member.

Students intended for: UG/PG

Elective or Compulsory: Elective

Semester: Odd/Even

Course Objective:

Metabolite profiling defines all the metabolites (small molecules) present in a biological sample. Metabolomics is the systematic study of the metabolic profiles in relation to changes the biological system encounters. Metabolomics is a complementary tool to other "–omics" in systems biology with a range of applications in phytochemistry, biomedical sciences (e,g biomarker identification) and other fields. The objective of the course is to introduce metabolomics to students followed by practical training involving a series of experiments, hands-on analytical exposure to process and analyse data obtained from advanced techniques (NMR/MS/HPLC) and statistical analysis. As a result of this course, the students will have strong foundations and first hand scientific understanding of current trends in Metabolomics.

Course Outline:

Module 1 [10 L]

Theory and Tutorials: Metabolites and metabolite profiling, Metabolomics - applications and its role in systems biology with case studies, Targeted and untargeted metabolomics, General work flow including quenching and sample preparation, Detection and quantification of metabolites by advanced analytical techniques (NMR/Mass spectroscopy, HPLC). Statistical methods (PCA, PLS, PLS-DA) in metabolomics. Pathway and metabolome databases. Software tools available for metabolomics analysis

Module 2 [32 L]

Practicals – mini-project involving metabolite profiling and metabolomics experiments based on Module 1 contents. Review and development of Protocols/workflow, Design and conduct of experiments, analytical techniques (NMR, MS, HPLC), Data handling using relevant software, Statistical analysis. Scientific report writing in metabolomics for evaluation.

Reference Books:

- **Metabolomics – A powerful Tool in Systems Biology,** Edited by J.Nielsen and M.C. Jewett, Springer Publishers
- **Metabolome Analyses: an Introduction** by Dr. Silas G. Villas-Bôas, Dr. Ute Roessner, Dr. Michael A. E. Hansen, Dr. Jørn Smedsgaard, Dr. Jens Nielsen. John Wiley & Sons, Inc, Print ISBN:9780471743446
- Additional reference material and scientific papers will be provided.