

***M Sc biotechnology course of study***

**Course Title: Metabolic biochemistry and secondary metabolites**

**Course No.: BT 526**

**Credits: 2**

**Objectives**

- To acquaint students with basic knowledge of metabolism
- To provide the students the basic knowledge of Vitamines and coenzymes,
- To understand Synthesis and metabolism of biomolecules
- To know the various types of secondary metabolites synthesized by plants and animals and their importance.
- To expose the students to practical methods used in biochemistry laboratory

**Introduction to metabolism**

**2hrs**

General characteristics of metabolic pathways: High energy compounds, Organic reaction mechanisms, Metabolic flux and coupled reactions; methods of investigation of metabolic pathways.

**Vitamins and coenzymes**

**3 hrs**

Classification. Role of vitamins, metals and other cofactors in enzyme function. Water soluble vitamins and their coenzymes: thiamin pyrophosphate, pyridoxal-5-phosphate, nicotinamide coenzyme, Flavin, Coenzyme A, lipoic acid, biotin, folate, ascorbic acid, cobalamine. Lipid soluble vitamins: Vit.A, Vit.D, Vit.E and Vit.K.

**Carbohydrate metabolism**

**7hrs**

Synthesis of carbohydrates (Tetrose, Pentose, Heptose, sucrose, glycogen, starch, cellulose), Pentose phosphate pathway, Digestion, absorption and mobilization of carbohydrates. Glycolysis reactions with emphasis on reaction mechanisms, feeder pathways of glycolysis, Gluconeogenesis, Citric acid cycle with emphasis on reaction mechanisms, Glyoxalate pathway, HMP pathway, ED pathway, fermentative pathways, electron transport chain (prokaryotic and eukaryotic), generation of ATP(Oxidative phosphorylation), glycogen metabolism. Regulation of carbohydrate metabolism.

**Lipid metabolism**

**6 hrs**

Digestion, absorption and mobilization of lipid in human. Synthesis and degradation of fatty acids, ketone bodies, triacyl glycerol, eicosanoids, phospholipids and glycolipids. Synthesis and utilization of cholesterol and cholesterol derivatives (bile acids, steroids hormones etc.) Regulation of lipid metabolism.

**Integration of metabolism:**

**2 hrs**

Integration of metabolic pathways, metabolic specialization of organs and hormonal regulation of metabolic pathways with emphasis on Insulin, glucagon, catachol amines.

**Nucleic acid metabolism**

**2hrs**

Synthesis, degradation and regulation of purine and pyrimidine nucleotides.

**Amino acid metabolism**

**4 hrs**

Digestion of proteins, absorption of amino acids. Transamination, deamination, urea cycle. Link between urea cycle and TCA cycle.

**Secondary Metabolism**

**6 hr**

Secondary metabolites of plants, animals and microorganisms. Importance of secondary metabolites, Main types of secondary metabolites

**Phenolic metabolism:** Structure functions and use of Phenolic compounds, Biosynthesis-shikimate/ aroginate pathway, biosynthesis of important phenolic compounds like coumarins, flavenoides, lignins, tannins, quinones

**Isoprenoid metabolism:** Mevalonic acid pathway and isopentenyl pyrophosphate synthesis. Structure, uses and biosynthesis of important terpens, steroids and carotenoides

**Special nitrogen containing metabolites:** Structure, uses and biosynthesis of amines, glycosides and alkaloides.