

**Syllabus for Master of Science**
**Microbiology**
**Subject Code: 02MB0456**
**Subject Name: Microbial Metabolism**
**M. Sc. Semester - II**

**Objective:** To offer extensive information about central & peripheral metabolic pathways and developing the perception about bioenergetics and metabolic engineering.

**Credits Earned:** 6 Credits

**Course Outcomes:** After completion of this course, student will be able to

- Establish insight on biosynthesis & breakdown pathways of Biomolecules.
- Relate the concept of regulation and overproduction in metabolism.
- Improve perceptions about metabolic reactions and bioenergetics.

**Pre-requisite of course:** Cell Biology and Fundamental Biochemistry.

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal(I)/(CSE)	Viva (V)	Termwork (TW) /Practicals (P)	
4	0	4	6	50	30	20	25	25	150

**Contents:**

Unit	Topics	Contact Hours
1	<b>Carbohydrate Metabolism:</b> Carbohydrate uptake; Glycolysis: ED pathway, EMP pathway, PPP Pathway; Gluconeogenesis; Citric acid cycle: Branched TCA, Reverse TCA & Glyoxylate cycle; Utilization of sugars other than glucose and complex polysaccharides; Regulation of Glycolysis & TCA, Phosphotransferase system; Bioenergetics of Carbohydrate metabolism.	15
2	<b>Amino acid &amp; Protein Metabolism:</b> Digestion of proteins and peptides; Amino acid biosynthesis; Amino acid reactions: Oxidation, Transamination, Deamination, Decarboxylation; Stickland reaction; The Urea Cycle; Breakdown of amino acids.	15
3	<b>Fatty Acid &amp; Lipid Metabolism:</b> Biosynthesis of Fatty Acids, Phospholipids & Isoprenoids; Lipid Digestion, Absorption & Transport; Fatty acid $\beta$ -oxidation of Saturated & Unsaturated Fatty acids; Ketone Bodies; Regulation of Fatty Acid Metabolism, Cholesterol metabolism.	15
4	<b>Metabolic Regulation:</b> Overview of cellular Bioenergetics; Regulation of metabolism: Regulation of enzyme synthesis & Regulation of enzyme activity; Metabolite Over Production & Metabolic engineering.	15
<b>Total Hours</b>		60

**References:**

1. **Fundamentals of Biochemistry**, (2016) 5th Edition, Donald Voet, Judith G. Voet, W. Pratt; Wiley publishers.
2. **The Physiology and Biochemistry of Prokaryotes** (2000) 2nd Edition by David White. Oxford University Press.
3. **Lehninger's Principles of Biochemistry**, 6<sup>th</sup> edition, (2013) by David L. Nelson and Michael M. Cox; W. H. Freeman.
4. **Microbial Physiology**, (2002) 3rd edition by Albert G. Moat and John W. Foster., John Wiley and Sons.
5. **Physical biochemistry: Principles and applications** (2009), 2nd Edition, by David Sheeham; John Wiley and Sons.
6. **Physical biochemistry: Applications to Biochemistry & Molecular Biology**, (1982), by David Freifelder; W. H. Freeman.

**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	25%	25%	15%	10%	5%

**Instructional Method:**

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.
- c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.