SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CBCS Syllabus for M.Sc. IInd Year (MICROBIOLOGY)

(Effective progressively from June 2015)

FOURTH SEMESTER

MB 401: FERMENTATION TECHNOLOGY (Four Credits)

Unit I: Microbial fermentations **(09)**

Metabolic pathways and metabolic control mechanisms, Industrial production of citric acid, lactic acid, enzymes (alpha amylase, lipase, xylase , pectinases, proteases) Acetone-butanol, Lysine and Glutamic acid, Alcoholic beverages, Distilled beverages, Beer, Wine.

Unit II: Microbial production of therapeutic compounds **(08)**

Microbial production of therapeutic compounds (β-lactum, aminoglycosides, ansamycines (Rifamycin), Peptide antibiotics (Quinolinones), Biotransformation of steroids, Vit.B-12 and riboflavin fermentation.

Unit III: Modern trends in microbial production **(08)**

Modern trends in microbial production of bioplastics (PHB,PHA), Bioinsecticides (thuricides) Biopolymer (dextran, alginates, xanthan, pullulan), Biofertilizer (nitrogen fixer Azatobacter , phosphate solubilising microorganisms), Single cell protein and production of biological weapons with reference to anthrax.

Unit IV: Biofuels **(09)**

Useful features of biofuels. The substrate digester and the microorganisms in the process of biogas production (Biomethanation). Production of bioethanol from sugar, molasses, starch and cellulosic materials. Ethanol recovery. Microbial production of hydrogen gas, biodiesel from hydrocarbons.

Unit V: Immobilization techniques, IPR and Patents **(11)**

Some industrial techniques for whole cell and enzyme immobilization. Application and advantages of cell and enzyme immobilization in pharmaceutical, food and fine chemical industries. Intellectual Property Rights (IPR), Patents, Trademarks, copyrights, secrets, Patenting of biological materials, International co-operation, Obligations with patent

applications, implication of patenting, current issues, hybridoma technology etc. Patenting of higher plants and animals, transgenic organisms and isolated genes, patenting of genes and DNA sequences, plant breeders rights and farmers rights.

PRACTICALS:

1) Production and characterization of citric acid using *A. niger*.
2) Microbial production of glutamic acid.
3) Production of rifamycin using *Nocardia* strain.
4) Comparison of ethanol production using various organic wastes/raw materials. (Free cells / immobilized cells).
5) Production and extraction of thuricides.
6) Laboratory scale production of biofertilizers. (Nitrogen fixer/ Phosphate solubilizers/ Siderophore producers).
7) Microbial production of dextran by *Leuconostoc mesenteroids*.
8) Microbial production of hydrogen gas by algae.

REFERENCES:

1) *Annual report in fermentation processes* by D. Pearlman, Academic Press
2) *Annual Review of Microbiology* by Charles E. Cliffton (Volumes)
3) *Biology of industrial microorganisms* by A. L. Demain.
4) *Biotechnology. A Text Book of Industrial Microbiology* by Creuger and Creuger. Sinaeur associates.
5) *Fundamentals of Biochemical Engineering* by Bailey and Ollis.
6) *Genetics and Biotechnology of Industrial Microorganisms* by C. L. Hershnergey, S.W. Queener and Q. Hegeman. Publisher ASM. Ewesis ET. Al 1998 Bioremediation Principles. Mac Graw Hill.
7) *Industrial microbiology* by G. Reed (ed), CBS publishers (AVI publishing comp.).
8) *Manual of Industrial Microbiology and Biotechnology* 2nd edition by Davis J.E. and Dmain A. L. ASM Publication.