Paper No- 18
Semester - VI
ADVANCED MICROBIOLOGY

THEORY MARKS: 100

Unit 1 Unit 1 Evolution of Microbial Genomes **No. of lectures: 12**

1.1 Salient features of sequenced microbial genomes, core genome pool, flexible genome pool and concept of pangenome
1.2 Horizontal gene transfer (HGT)
1.3 Evolution of bacterial virulence - Genomic islands, Pathogenicity islands (PAI) and their characteristics

(Chapter 13, Biology of Microorganisms by Madigan MT, Martink JM, Dunlap PV and Clark DP, 12th Ed., Pearson-Bejamin Cummings, 2009, Pages: 359-362;
Chapter 11, Bacterial Pathogenesis- A molecular Approach by Wilson BA, Salyers AA Whitt DD and Winkler ME, 3rd Ed., 2011, ASM Press, Pages:111-128)

Unit 2 Metagenomics **No. of lectures: 12**

2.1 Brief history and development of metagenomics
2.2 Understanding bacterial diversity using metagenomics approach
2.3 Prospecting genes of biotechnological importance using metagenomics
2.4 Basic knowledge of viral metagenome

(Chapter 13, Biology of Microorganisms by Madigan MT, Martinko JM, Dunlap PV and Clark DP, 12th Ed., Pearson-Bejamin Cummings, 2009, Pages: 364-365)

www.nature.com/nrmicro/focus/metagenomics

Unit 3 Molecular Basis of Host-Microbe Interactions **No. of lectures: 12**

3.1 Epiphytic fitness and its mechanism in plant pathogens
3.2 Hypersensitive response (HR) to plant pathogens and its mechanism
3.3 Type three secretion systems (TTSS) of plant and animal pathogens

(Chapter 8, Molecular Plant-Microbe interaction by Bouarab K, Brisson N, Daayf F, CAB International, 2009, Pages: 179-181.
Chapter 13, Bacterial Pathogenesis- A molecular Approach by Wilson BA, Salyers AA Whitt DD and Winkler ME, 3rd Ed., 2011, ASM Press, Pages:256-269)

Unit 4 Systems and Synthetic Biology **No. of lectures: 12**

4.1 Networking in biological systems, Quorum sensing in bacteria
4.2 Co-ordinated regulation of bacterial virulence factors
4.3 Basics of synthesis of polivirus in laboratory
4.4 Future implications of synthetic biology with respect to bacteria and viruses

(Chapters 1&2, A First Course in Systems Biology by Voit EO, Ist Ed.,Garland Science, Pages:1-18, 19-50)

http://www.synbioproject.org/topics/synbio101/definition/
http://www.stonybrook.edu/ovprpub/tsc/polio.html

PRACTICALS MARKS: 50

1. Extraction of metagenomic DNA from soil
2. To understand the impediments in extracting metagenomic DNA from soil
3. PCR amplification of metagenomic DNA using universal 16s ribosomal gene primers
4. Case study to understand how the poliovirus genome was synthesized in the laboratory
5. Case study to understand how networking of metabolic pathways in bacteria takes place

SUGGESTED READING

1. Fraser CM, Read TD and Nelson KE. Microbial Genomes, 2004, Humana Press
2. Miller RV and Day MJ. Microbial Evolution- Gene establishment, survival and exchange, 2004, ASM Press
3. Bull AT. Microbial Diversity and Bioprospecting, 2004, ASM Press
4. Sangdun C. Introduction to Systems Biology, 2007, Humana Press
5. Klipp E, Liebermeister W. Systems Biology – A Textbook, 2009, Wiley –VCH Verlag
6. Caetano-Anolles G. Evolutionary Genomics and Systems Biology, 2010, John Wiley and Sons

ONLINE READING MATERIAL

1. mmbr.asm.org/content/68/4/669.short
2. www.nature.com/nrmicro/focus/metagenomics
3. www.ncbi.nlm.nih.gov/pubmed/15568985
4. http://www.systembiologie.de/en
5. http://www.synbioproject.org/topics/synbio101/definition/
6. http://www.stonybrook.edu/ovprpub/tsc/polio.html
7. http://www.fas.org/biosecurity/education/dualuse/FAS_Wimmer/FAS_Topic_2_A.html