

FACULTY OF LIFE SCIENCES

SYLLABUS

For

Bridge Course in MICROBIOLOGY (Under Credit Based Continuous Evaluation Grading System) (Semester-III)

Session: 2016-17



GURU NANAK DEV UNIVERSITY AMRITSAR

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Bridge Course in Microbiology (Semester System)
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Semester-III

Course No.	C/E/I	Course Title	Credits			Total Credit S
			L	T	P	
MCL501	C	Clinical And Diagnostic Microbiology	3	0	0	3
MCL502	C	Environmental Biotechnology	3	0	0	3
MCL503	C	Industrial Microbiology	3	0	0	3
CSL 591	C	Computer Applications	3	0	0	3
	I	Interdisciplinary Course**	4	0	0	4
MCP521	C	Clinical Diagnostic lab	0	0	3	3
MCP522	C	Environmental & Industrial Microbiology Lab	0	0	4.5	4.5
		Total	-	-	-	23.5

**** Interdisciplinary Course will be selected from schemes of courses of other Departments.**

MCL-501: CLINICAL AND DIAGNOSTIC MICROBIOLOGY

Credits : 3-0-0

Collection, transport, and examination of clinical specimens, preliminary processing of biological samples: Stool, blood, urinary and Gastro intestinal tract, Culture containers, media, Storage of clinical specimens.

Adaptive Immunity, type and components of adaptive immune response, features of adaptive immune responses, cells of Immune system recognition of antigen, activation of lymphocytes, effector phase of immune responses. Immunity to viruses, evasion of immune mechanisms by parasites, vaccine development.

Clinical features, laboratory diagnosis, treatment and prevention of: Cholera, Diphtheria & DPT vaccination, Tuberculosis DOT treatment, MDR tuberculosis Pneumonia, Typhoid, Hepatitis: type of hepatitis, vaccine schedule of hepatitis and AIDS. Control of communicable diseases.

AIDS definition, types of HIV receptor & co-receptor associated with AIDS, control & vaccine: General studies on Plague, Rickettsia, yellow fever, Amoebiasis, Trypanosomiasis, Malaria and Syphilis.

Books Recommended:

1. Medical Microbiology by C.G.A. Thomas, 1988. Baillion Tindall, London.
2. Essential of Medical Microbiology by R. Bhatia and R.L. Ichhpujani, 1994. Jaypee Brothers Medical Pub. (p) Ltd. New Delhi.
3. Medical Microbiology by Mims, Playfiar, Roitt, Wakelin and Williams, 1993, Mosby-year Book Europe Ltd., U.K.
4. Mackie and Mc Cartney, Practical Medical Microbiology (Ed.) Geranld College, J. Fraser, A.G., Marmoin, B.P. and Simmons, A., 1996. Churchill Divingstone.
5. Microbiology: Concepts and Applications by Pelczar, Chan and Krieg, 1993. Mc Graw Hill, Inc., U.S.A.
6. Microbiology: A Human Perspective by Nester, E.W. Roberts C.E., Nester, M.T. 1995. Wm. C. Brown Communication. Inc., U.S.A.

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MCL-502: ENVIRONMENTAL BIOTECHNOLOGY

Credits: 3-0-0

Purification of waste water by aerobic processes, Communal sewage and industrial effluents, Aims and limitations of aerobic bioprocessing. Activated sludge process. Trickle filter process, lagoon process. Purification of effluents by anaerobic processing. Biology of methane formation,.

Microbiology of cellulose degradation, Enzymatic aspects of cellulolysis. Potential application of Microbial cellulases. Microbiology of lignin degradation ,white-rot, brown-rot, and soft-rot type fungal attack in ligninolysis. Enzymology of lignin degradation and their biotechnological applications. Brief account of microbial degradation of pectin and hemicellulose with their potential applications.

The concept of Bioremediation efficacy testing approaches to bioremediation: Environmental modifications for Bioremediation, Microbial seeding and Bioengineering Approaches to the bioremediation of pollutants. Gaseous and Heavy metal air pollutants, Microbes as sources of Atmospheric pollutants, microbes as sinks for Bioscrubbers and biofilters.

Microbial Insecticides: *Bacillus thuringiensis*. The concept of endotoxins and cry genes, *B. thuringiensis* as a present day bioinsecticide. (*Bacillus sphaericus*) *B. popilliae*) and Baculoviruses. Biology of baculoviruses, Baculoviruses as Insecticides and their future potential. Bacterial leaching from ores, microorganisms associated with recovery of copper by direct and indirect leaching, uranium leaching.

Books Recommended:

1. Atlas. R.M. and Bartha, M (1981). Microbial Ecology Fundamentals and applications, Addison-Wesley, Philipines.
2. Campbel, R. (1977). Microbial Ecology, Balckwell Scientific London.
3. Grant, W.D. and Long P.E. (1981). Environmental Microbiology, Balckie, London.
4. Bioreactors in Biotechnology: A practical approach (1991). Scragg. A.H. Ellis Horwood Ltd.

MCL-503: INDUSTRIAL MICROBIOLOGY

Credits: 3-0-0

Microbial biodiversity and its importance in industrial microbiology, methods of isolation. High throughput screening (HTS) of microbes and metagenomic libraries for industrially important enzymes, bio-molecules (anti-cancer, anti-inflammatory antimicrobial compounds, etc). raw materials of industrial importance. Continuous and fed batch cultures.

Strain development by mutagenesis, protoplast fusion and transformation . Methods for cloning the genes. System biology (genome, transcriptome, proteome, metabolome, fluxome) in strain improvement.

Important microbial products and technology for production of bioethanol from cellulosic waste, Single cell oil, polysaccharides (xanthan), fermentation of pharmaceutical molecules lovastatin, carotene, production of recombinant proteins (Hepatitis vaccines, insulin, interferons).

Industrially important biotransformation, Immobilization of whole cells and enzymes, protein engineering, metabolic engineering, Intellectual property rights (IPR) and patents laws governing in Indian patents related to microbial products and processes.

Books Recommended :

1. Manual Industrial Microbiology and Biotechnology (eds) A.L. Demain and Solomon, N. A. (1986). ASM, Washington. D.C.
2. Principles of Fermentation Technology Stansbury and Whittaker Pergamon Press.
3. Recombinant microbes for industrial and agricultural application (eds) Y. Murroka, T. Imanuka (1994) Marcel Dekker Inc.
4. Biotechnology 2nd Edition W. Crueger and A. Crueger. (1992) Panima Publishers.
5. Microbial Technology. Vol I and II Eds. Peppler and Perlman, (1979) Academic Press.
6. Comprehensive Biotechnology Vol III and IV Ed. Moo Young (1984) Pergamon Press.
7. Recent review and research articles from scientific journals
8. Industrial Microbiology :An Introduction. Waites, M.J., Morgan, N., Rockey, J.S.,and Higton, G. (2001). Blackwell publishing
9. Proteomics and protein protein interactions : Biology, chemistry, bioinformatics and drug design. Waksman.(2006).

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Test Books:

1. Raghavarao, D.: Statistical Techniques in Agricultural and Biological research (1983), Oxford and IBH Publishing Co. [Chapters: 2,3,4,5,7,8,9 and 10].
2. Fowler J.; Cohen L. and Jarvis, P.: Practical Statistics for Field Biology, 2nd Edition (1998), John Wiley and sons. [Chapters: 4,5,6,(7.1-7.6), 9(9.1-9.4), 12(12.1-12.7),13(13.1-13.4,13.6,13.7),14(14.1-14.5,14.7), 15(15.3-,15.8,15.10-15.11),16(16.9-16.13),17(17.1-17.3,17.5,17.6,17.8)].

REFERENCE BOOKS:

1. Wayne W. Daniel: Biostatistics: A Foundation For analysis In Health sciences, 7th Edition (1999), John Wiley and sons.
2. Finney D.J.: Statistics for Biologists (1980),Chapman and Hall Ltd.
3. Hoel, P.G.: Elementary statics 3rd Edition (1971), John Wiley and sons.
4. Ross, S.M.: Introductory Statics,2nd Edition (2005),Academic Press.
5. Bland, M.: An introduction to Medical Statistics, 3rd Edition (2006), Oxford University Press.
6. Woodworth, G.: Biostatistics: A Bayesian Introduction (2004), John Wiley and sons.

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MCP-521: CLINICAL DIAGNOSTIC LAB

Credits: 0-0-3

- Total lymphocyte, TLC, DLC and ESR estimation
- Estimation of blood sugar
- Estimation of blood urea
- Lipid profile studies
- Estimation of Creatinine
- Urine culture for UTI infections
- Malaria, HIV, HCV detection
- ELISA application for detection of HBV through serum

MCP-522: ENVIRONMENTAL & INDUSTRIAL MICROBIOLOGY LAB

Credits: 0-0-4.5

- Enumeration of microorganisms from different ecosystems.
- To study the effect of different sugar and NaCl concentration on yeast growth.
- Effect of different temperatures on yeast growth.
- Isolation of N₂ fixing, Nitrifying and denitrifying bacteria.
- Soil Enrichment Technique.
- To study the BOD & COD levels of different water systems.
- Isolation of cellulase producing fungi.
- Differentiation of white-rot and brown-rot fungi.
- Bacteriological analysis of water by presumptive, confirmatory and completed tests.
- Screening industrially important microorganisms from soils, food processing wastes, animal droppings.
- To evaluate the production of alcohol from molasses & lignocellulosics.
- Microbial biomass production (fungi/bacteria/yeast) batch and continuous culture.
- To compare production of citric acid using sucrose and molasses as carbon source.
- Production of lactic acid using cheese whey as substrate.
- Production of extracellular enzymes (pectinase and xylanase) by thermophilic and mesophilic fungal culture.
- To isolate rare genera of microorganisms for novel antibiotic production, and to evaluate the potential of different media for antibiotic production.
- To study the protoplasting and regeneration in fungi.
- Isolation of fungi genomic DNA and plasmid DNA by mini prep protocol.
- To study the role of plasmid in degradation of xenobiotic compounds and curing of plasmid.
- PCR amplification of DNA from natural sources.
- Purification of proteins and SDS-PAGE