PCMBG20: MAIN PRACTICAL –I: APPLIED MICROBIOLOGY AND IMMUNOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: II	PCMBG20	Main Practical I: Applied Microbiology and Immunology	Practical	Core	5	5	100

Course Objective: To enable the students to get hands-on training on various aspects of general, food, agricultural, environmental microbiology and immunotechnology.

Course Outcomes (CO):

At the end of the course, the learners will be able to;

CO1: Identify morphology of bacteria using different staining procedure and isolating them by pure culture techniques.

CO2: Assess the quality of air, water, food and soil samples.

CO3: Examine the activity of extracellular enzymes.

CO4: Apply agglutination and precipitation methods to detect antigen and antibody.

CO5: Select appropriate chromatographic methods to separate aminoacids, pigments and from crude extracts.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	L	H
CO2	H	H	H	L	M	H
CO3	H	H	M	M	L	H
CO4	L	H	H	H	L	H
CO5	L	H	M	L	M	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	L	H
CO2	H	H	H	L	L	H
CO3	H	M	M	M	L	H
CO4	H	M	H	H	L	H
CO5	H	M	M	L	L	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

1. Cleaning of glassware and sterilization.
2. Preparation and use of glassware cleaning solutions, sterilization.
3. Micrometry - counting and measurements.
4. Pure and axenic culture techniques - serial dilution - pour plate, spread plate, streak plate methods and stab culture techniques.
5. Bacterial Staining methods - simple, Gram's, acid fast, flagella, capsule and spore.
6. Fungal staining method – Lacto phenol cotton blue.
7. Motility of bacteria – Hanging drop technique.
8. Determination of growth - growth curve - generation time and a synchronous growth.
9. Microbial analysis of food products - bacterial and fungal.
10. Extracellular enzyme activities - cellulase, protease, lipase and phosphatase.
11. Dairy microbiology - Direct microscopic count - Standard plate count - reductase test (resazurin/methylene blue) - isolation of microbes from yoghurt, curd.
12. Quantification of microorganisms in air - solid and liquid impingement techniques.
13. Analysis of water – Most probable number test and membrane filter technique.
14. Microbial flora from different soil types and habitats - isolation of nitrogen fixing bacteria, phosphate solubilizing organisms- development of Winogradsky Column
15. Precipitation techniques: Agar gel diffusion - Ouchterlony's method, Single radial immunodiffusion, Counter immuno electrophoresis & Rocket Immuno Electrophoresis.
16. Agglutination techniques: Blood grouping and Rh factor - Latex agglutination - RF & ASO. Haemagglutination RPHA / IHA.
17. Labelled Assays: Demo: Enzyme Linked Immunosorbent Assay (ELISA).
18. Separation of pigments using paper chromatography.
19. Separation of compounds from crude extracts using TLC.

REFERENCE BOOKS

1. Dubey, R.C. and Maheshwari, D.K. (2002) Practical Microbiology, 1st Edn. S. Chand & Co. Ltd., New Delhi.
2. Cappuccino, J. and Sherman, N. (2002) Microbiology: A Laboratory Manual, 6th Edn. Pearson Education Publication, New Delhi.

3. Collee, J.C., Duguid, J.P., Fraser, A.C. and Marimon, B.P. (1996) Mackie and McCartney Practical Medical Microbiology, 14th Edn. Churchill Livingstone, London.
4. Holt, J.S., Krieg, N.R., Sneath, P.H.A. and Williams, S.S.T. (1994) Bergey's Manual of Determinative Bacteriology, 9th Edn. Williams & Wilkins, Baltimore.
5. Gerhardt, P., Murray, R.G., Wood, W.A. and Kreig, N.R. (Eds) (1994) Methods for General and Molecular Bacteriology. ASM Press, Washington, DC.
6. Finegold, S.M. (2000) Diagnostic Microbiology, 10th Edn. C.V. Mosby Company, St. Louis.

OER:

VIRTUAL LABS/ INTERACTIVE SIMULATIONS:

1. www.vlab.co.in
2. www.aview.in/aview
3. www.pbs.org
4. www.micro.magnet.fsu.edu/primer/java/scienceopticsu

VIDEO LESSONS:

1. www.learnerstv.com
2. www.webcast.berkeley.edu
3. www.cosmolearning.org

PCMBH20: MAIN PRACTICAL – II: MEDICAL MICROBIOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: II	PCMBH20	Main Practical II: Medical Microbiology	Practical	Core	5	5	100

Course Objective: To enable the students to get hands-on training on various aspects of Clinical Microbiology, Microbial physiology and Biomolecules.

Course Outcomes (CO):

At the end of the course, the learners will be able to;

CO1: Demonstrate collection, transport and processing of clinical specimens.

CO2: Identify the bacterial pathogens from various clinical samples and detect their antimicrobial activity.

CO3: Analyse the clinical specimens for the examination and cultivation of pathogenic fungi.

CO4: Estimate worm burden stool for the identification of parasite.

CO5: Enumerate blood cells.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	L	H
CO2	H	H	M	H	L	H
CO3	H	H	M	H	L	H
CO4	H	H	H	H	L	H
CO5	H	H	H	H	L	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	L	H
CO2	H	H	H	H	L	H
CO3	H	H	M	M	M	H
CO4	H	H	M	M	M	H
CO5	H	H	L	M	L	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

1. Collection and transport of pathological specimens for microbiological examinations.
2. Bacteriological methods: Microscopic examination - blood - faeces - pus - sputum - throat swab and nose swab - urine - body fluids
3. Isolation and identification of the pathogen – Pure and mixed culture and biochemical tests.
4. Antimicrobial assay - sensitivity test - Stokes and Kirby Bauer methods - Disc diffusion - agar dilution - broth dilution - MBC/MIC. Quality control for antibiotics.
5. Mycological methods: Macroscopic observation - microscopic observation - culture. Identification of *Mucor, Rhizopus, Aspergillus, Penicillium, Candida, Trichophyton, Microsporum, Epidermophyton* - SDA/Corn Meal Agar - Slide culture method - Germ tube method - Sugar assimilation/fermentation tests.
6. Examination of parasites in clinical specimens - ova/cyst in faeces.
7. Haematology: Total count (TC): RBC and WBC, - Differential count (DC) - Haemoglobin level, - Bleeding time - Clotting time – ESR.

REFERENCE BOOKS:

1. Dubey, R.C. and Maheshwari, D.K. (2002) Practical Microbiology, 1st Edn. S. Chand & Co. Ltd., New Delhi.
2. Cappuccino, J. and Sherman, N. (2002) Microbiology: A Laboratory Manual, 6th Edn. Pearson Education Publication, New Delhi.
3. Collee, J.C., Duguid, J.P., Fraser, A.C. and Marimon, B.P. (1996) Mackie and McCartney Practical Medical Microbiology, 14th Edn. Churchill Livingstone, London.
4. Holt, J.S., Krieg, N.R., Sneath, P.H.A. and Williams, S.S.T. (1994) Bergey's Manual of Determinative Bacteriology, 9th Edn. Williams & Wilkins, Baltimore.
5. Finegold, S.M. (2000) Diagnostic Microbiology, 10th Edn. C.V. Mosby Company, St. Louis.

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VIRTUAL LABS/ INTERACTIVE SIMULATIONS:

1. www.vlab.co.in
2. www.aview.in/aview
3. www.pbs.org
4. www.micro.magnet.fsu.edu/primer/java/scienceopticsu

VIDEO LESSONS:

1. www.learnerstv.com
2. www.webcast.berkeley.edu
3. www.cosmolearning.org

PCMBN20: MAIN PRACTICAL – III: GENETIC ENGINEERING

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: IV	PCMBN20	Main Practical III: Genetic Engineering	Practical	Core	5	5	100

Course Objective: To provide hands-on training and acquire adequate skill required to isolate, demonstrate and quantitate nucleic acids, transfer DNA to bacteria and separate biomolecules by electrophoresis.

Course Outcomes (CO):

At the end of the course, the learners will be able to;

CO1: Utilize technical skills in isolation of DNA, their quantification and plasmid.

CO2: Analyse gene transfer mechanism and protein.

CO3: Use the basic skill on blotting techniques & PCR.

CO4: Select methods for the immobilization of enzymes.

CO5: Demonstrate the process of induction of mutation.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	L	H
CO2	H	H	H	L	M	H
CO3	H	H	M	M	L	H
CO4	L	H	H	H	L	H
CO5	L	H	M	L	M	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	L	H
CO2	H	H	H	L	L	H
CO3	H	M	M	M	L	H
CO4	H	M	H	H	L	H
CO5	H	M	M	L	L	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

1. Isolation of DNA and RNA from microbial system - quantification - chemical methods dinitrophenol, orcinol - physical methods - UV absorption.
2. Isolation of plasmid DNA from bacteria.
3. Size characterization of DNA by agarose gel electrophoresis.
4. Enzyme immobilization technique.
5. Induction of mutation by ultra-violet radiation and chemical mutagens.
6. Preparation of competent *E. coli* cells.
7. Transformation of Plasmid DNA to the *E. coli* cells.
8. Southern blotting
9. Western blotting.
10. Separation of proteins by SDS - PAGE
11. PCR amplification – Demonstration.

REFERENCE BOOKS :

1. Ausubel, F.M., Roger, B., Robert E. Kingston, David A. Moore, Seidman J.G., John A. Smith. and Kelvin, S. 1992. Third Edition, Short Protocols in Molecular Biology, Jolm Wiley &Sons Inc., New York.
2. Berger, S.L. and Kimmel, R. 1987. Guide to Molecular Cloning Techniques, Academic Press, Inc., New York.
3. Brown, T.A. 1998. Molecular Biology Lab Fax 11 Gene Analysis, Academic Press, London.
4. Cappuccino, J.H. and Sherman, N 2007. Microbiology – A Lab Manual, seventh Edition, the Benjamin Publishing Company, Singapore.
5. Malov, S.R. 1990. Experimental Techniques in Bacterial Genetics, Jones and Bartlett Publishers, Boston.
6. Miller, J.H. 1992. A Short Course in Bacterial Genetics: A Lab Manual &Hand Book for *E. coli* and related Bacteria. Cold spring Harbor Lab press, Cold Spring Harbour.

OER:

VIDEOS/VIDEO LESSONS / E-CONTENT FOR LEARNING:

1. http://www.learnerstv.com/
2. http://webcast.berkeley.edu/
3. http://cosmolearning.org/
4. http://www.world-lecture-project.org/
5. http://cec.nic.in/
6. http://epgp.inflibnet.ac.in/
7. http://www.co-learn.in/

PCMBO20: MAIN PRACTICAL – IV: TEXTILE AND COSMETIC MICROBIOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: IV	PCMBO20	Main Practical IV: Textile and cosmetic Microbiology	Practical	Core	5	5	100

Course Objective: To provide hands-on training and acquire adequate skill required for testing the quality of cosmetics and textile materials.

Course Outcomes (CO):

At the end of the course, the learners will be able to;

CO1: Utilize the techniques for decolourization of textile industrial waste.

CO2: Estimate of BOD, COD and total solids in effluent sample.

CO3: Demonstrate the antimicrobial activity of textile materials.

CO4: Evaluate the antifungal property of treated textile materials.

CO5: Enumerate microorganisms in cosmetics, perfumes and essential oils.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	L	H
CO2	H	H	H	L	M	H
CO3	H	H	M	M	L	H
CO4	L	H	H	H	L	H
CO5	L	H	M	L	M	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	L	H
CO2	H	H	H	L	L	H
CO3	H	M	M	M	L	H
CO4	H	M	H	H	L	H
CO5	H	M	M	L	L	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

1. Determination of biological oxygen demand (BOD) of water.
2. Determination of chemical oxygen demand (COD) of water.
3. Estimation of total solids in effluent sample.
4. Analysis of TDS of effluent content.
5. Estimation of total suspended solids of effluent.
6. Decolorization of distillery or textile industrial waste.
7. Antibacterial activity assessment of textile materials.
8. Evaluation of antifungal property of treated textile materials.
9. Testing for antibacterial activity and efficacy on textile products, Qualitative and quantitative.
10. Determination of antibacterial activity of Textile fabrics by Agar diffusion plate test.
11. Microbiological Enumeration Tests of Cosmetics, Perfumes and Essential Oils.

REFERENCES:

1. R.C. Dubey and D.K.Maheswari. (2005) Practical Microbiology. S.Chand & Company.
2. S.Rajan and R.Selvi Christy. (2007) Experimental Procedures in Life Sciences. Anjana Book House Publishers & Distributors.
3. Philip A. Geis. (2006). Cosmetic Microbiology. A Practical Approach. 2nd edition. Taylor and Francis Group.

OER:

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1. http://www.learnerstv.com/
2. http://webcast.berkeley.edu/
3. http://cosmolearning.org/
4. http://www.world-lecture-project.org/
5. http://cec.nic.in/
6. http://epgp.inflibnet.ac.in/
7. http://www.co-learn.in/

PCMBF20: INDUSTRIAL AND PHARMACEUTICAL MICROBIOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: II	PCMBF20	Industrial and pharmaceutical Microbiology	Theory	Core	5	4	100

Course Objective: To provide an in depth understanding about industrially important organisms, strain improvement and production of major products.

Course Outcomes (CO):

At the end of the course, the learners will be able to;

CO1: Outline the importance of production strain in industries.

CO2: Discuss on fermentors and fermentation process.

CO3: Describe the upstream and downstream processing.

CO4: Analyse the steps involved in vaccine, toxoid and antisera production and evaluate the standardization of antiseptics and disinfectants..

CO5: Assess good practice and regulation involved in utilizing microbial product for pharmaceutical applications**.**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	H
CO2	H	M	M	L	H	H
CO3	H	M	M	L	H	H
CO4	H	M	M	L	H	H
CO5	H	H	H	L	H	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	H
CO2	H	M	M	H	H	H
CO3	H	M	M	H	H	H
CO4	H	M	M	H	H	H
CO5	H	H	H	H	H	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

UNIT- I: Introduction to Fermentation. (9 hours)

1.1 Introduction to fermentation – the range of fermentation process. (K1,K2)

1.2 The chronological development of the fermentation industry. (K1,K2)

1.3 The component parts of a fermentation process. (K1,K2)

1.4 Isolation of Industrially important organisms. (K1,K2,K3,K4)

1.5 Preservation of industrially important organisms. (K1,K2,K3,K4)

1.6 Strain improvement of industrially important microorganisms. (K1,K2,K3,K4, K5)

UNIT-II: Fermentors and Development of Inoculum. (9 hours)

2.1 Development of inoculum - Scale up (Pilot study). (K1,K2)

2.2 Upstream processing – media for industrial fermentation – formulation – sterilization – Microbial growth kinetics. (K1,K2,K3,K4)

2.3 Fermentation – types. (K1,K2)

2.4 Downstream processing. (K1,K2)

2.5 Fermentor/ Bioreactors – Parts and Design. (K1,K2)

2.6 Types of Bioreactors – Instrumentation and control.(K1,K2,K3)

UNIT- III: Microbial Productions. (12 hours)

3.1 Production of Organic acids (Citric acid, Acetic acid). (K1,K2,K3)

3.2 Production of Amino acids (L - Glutamic acid , L - Lysine). (K1,K2,K3)

3.3 Production of Antibiotics (Penicillin, Streptomycin, Tetracyclines). (K1,K2,K3)

3.4 Production of Enzymes (Amylases, Proteases and Pectinases). (K1,K2,K3)

3.5 Production of vitamins (B12, B2 and C). (K1,K2,K3)

3.6 Production of alcoholic beverages (wine and beer). (K1,K2,K3)

UNIT- IV: Vaccine Production and Pharmaceutical Standardisation. (8 hours)

4.1 Production of different types of vaccines. (K1,K2,K3)

4.2 Toxoid, antisera production and their standardization. (K1,K2,K3)

4.3 Preparation of Antiseptics and their uses. (K1,K2,K3)

4.4 Preparation of disinfectants and their standardization. (K1,K2,K3)

4.5 Types of water used in pharmaceutical industries (DM/Purified water). (K1,K2,K3)

4.6 Water for injection used in pharmaceutical industry and pyrogen testing. (K1,K2,K3,K5)

UNIT –V: Microbial Assay of Antibiotics. (7 hours)

5.1 Sub culturing and culture suspension preparation. (K2,K3,K4,K5)

5.2 Microbial assay of antibiotics and vitamins. (K2,K3,K4,K5)

5.3 Sterility testing. (K2,K3,K4,K5)

5.4 Bacterial Endotoxin Test (BET). (K2,K3,K4,K5)

5.5 Good Documentation Practice (GDP) – SOP – GLP. (K2,K3,K4,K5)

5.6 Failure investigation. (K1,K2,K3)

TEXT BOOKS:

1. Patel A.H (2001). Industrial Microbiology. 3rd edition, Mac Millan India ltd, Chennai.
2. Chisti, Y., (2006) Fermentation, Biocatalysis and bioseparation, Encyclopedia of Bioprocess Technology, Vol. 5, John Wiley and Sons, New York

REFERENCE BOOKS:

1. Casida J.E (1986). Industrial Microbiology, 1st edition. Wiley Eastern publishers.UK
2. Stanbury P.F., Whitaker A and Hall S.J (1995). Principles of Fermentation technology. 1st edition, Pergamon, UK.
3. Presscott and Dunn, S., (1982) Industrial Microbiology. 4th edition .The AVI Publishing Company Inc., USA.
4. Belter, P.A., Cussler, E.L. and Hu, W.S., (2005) Bioseparation: Downstream processing for Biotechnology,1st edition. John Wiley and Sons, N.Y

OER:

1. http://www.loc.gov/
2. http://library.clark.edu/
3. http://www.dli.ernet.in/
4. http://www.loc.gov/education/

PCMBM20 : BIOETHICS AND BIOSAFETY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: IV	PCMBM20	Bioethics and Biosafety	Theory	Core	6	4	100

Course Objective: To provide the learners knowledge about biosafety concerns at the level of individuals, institution, society, region, country and the world.

Course Outcomes (CO):

At the end of the course, the learners will be able to;

CO1: Outline the principles of bioethics and explain the biosafety concerns with safeguard measures.

CO2: Compile the BSA statement for the industrial production of pharmaceuticals.

CO3: Adapt the WHO quality standards in food process technology.

CO4: Discuss on the global scenario of patenting.

CO5: Comprehend the forms of patents, patentability and process of patenting.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	M	M	H
CO2	H	H	M	L	L	H
CO3	H	M	L	H	M	H
CO4	H	M	L	H	M	H
CO5	H	H	M	M	H	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	H	H
CO2	H	H	H	M	L	H
CO3	H	H	H	L	M	H
CO4	H	M	H	L	M	H
CO5	H	H	H	L	H	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

UNIT-I : Principles of Bioethics. (15 hours)

1.1 Definition- Bioethics. (K1,K2)

1.2 Legality, morality and ethics- An introduction (K1,K2)

1.3 Intoduction to the principles of Bioethics. . (K1,K2)

1.4 Principles of autonomy. . (K1,K2)

1.5 Human rights. . (K1,K2)

1.6 Beneficence and privacy justice equality. . (K1,K2)

UNIT-II : Biosafety concerns. (15 hours)

2.1 Introduction to Biosafety. . (K1,K2)

2.2 Concept and issues of Biosafety. . (K1,K2)

2.3 Rational Vs subjective perceptions of risks and benefits. . (K1,K2)

2.4 Relationship between risk hazard, exposure, and safe guard. . (K1,K2)

2.5 Biosafety concerns at the level of individuals, institutions, society, region, country and the world. . (K1,K2,K3)

2.6 Lab associated infections. . (K1,K2,K4)

UNIT-III: Statement of Ethical practice (15 hours)

3.1 Introduction to BSA. . (K1,K2)

3.2 History of BSA . . (K1,K2)

3.3 British Sociological Association (BSA) statement of ethical practices of biotechnology in the production of pharmaceutical products. . (K1,K2)

3.4 BSA statement ethical practices of biotechnology in the production of drugs. . (K1,K2,K3)

3.5 BSA statement ethical practices of biotechnology in the production vaccines . (K1,K2,K3)

3.6 BSA statement ethical practices of biotechnology in the production biomolecules. (K1,K2,K3)

UNIT-IV: WHO quality standards. (15 hours)

4.1 Introduction to WHO and its functions. (K1,K2)

4.2 WHO standards – Quality control. (K1,K2,K3)

4.3 Quality control in food process technology. (K1,K2,K3,K4,K5)

4.4 Quality control in dairy product technology. (K1,K2,K3,K4,K5)

4.5 Quality control for potable water. (K1,K2,K3,K4,K5)

4.6 Quality control measures in pharmaceutical industries. (K1,K2,K3,K4,K5)

UNIT-V : IPR and Patenting. (15 hours)

5.1 Introduction to IPR and Patenting. (K1,K2)

5.2 GATT and IPR, forms of IPR, IPR in India, WTO Act. (K1,K2,K3,K4,K5)

5.3 Convention on Biodiversity (CBD), Patent Co-operation Treaty (PCT). (K1,K2,K3,K4,K5)

5.4 Forms of patents and patentability, process of Patenting. (K1,K2,K3,K4,K5)

5.5 Indian and international agencies involved in IPR & patenting. (K1,K2,K3,K4,K5)

5.6 Global scenario of patents and India's position, patenting of biological material, GLP, GMP. (K1,K2,K3,K4,K5)

TEXT BOOKS:

1. Frederic H. Erbisch, Karim M. Maredia (2004). Intellectual Property Rights in Agricultural Biotechnology, CABI Publisher.
2. John Bryant (2002) Bioethics for Scientists. John Wiley and Sons Publisher.

REFERENCES BOOKS:

1. Mittal D.P. (1999). Indian Patents Law. Taxmann Allied Services (p) Ltd.
2. Christian Lenk, Nils Hoppe, Roberto Andorno (2007). Ethics and Law of Intellectual Property: Current Problems in Politics, Science and Technology, Ashgate Publisher (p) Ltd.
3. Felix Thiele, Richard E. Ashcroft (2005). Bioethics in a Small World. Springer.

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DIGITAL LIBRARIES:

1. http://www.loc.gov/
2. http://library.clark.edu/
3. http://www.dli.ernet.in/
4. http://www.loc.gov/education/