VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MICROBIOLOGY SEM III
LIST OF PRACTICALS

MBP-3005

1. Screening of citric acid and lactic acid producing microorganisms.
2. Screening of cellulase, amylase and protease producing microorganisms.
3. Production of fungal amylase by solid state fermentation.
4. Production of fungal amylase by submerged fermentation
5. Partial purification of amylase by ammonium sulphate precipitation and dialysis/column chromatography and calculation of specific activity & fold purification.
6. Cell disruption by sonication and estimation of intracellular protein.
7. Production of ethanol using pure carbohydrate.

   (a) Determination of pH, TSS (°Brix)

   (b) Determination of alcohol (ethanol) percentage.

   (c) Determination of phenol content

   (d) Estimation of reducing & total sugar.
8. Production of ethanol using agro-industrial waste.

   (a) Determination of pH, TSS (°Brix)

   (b) Determination of alcohol (ethanol) percentage

   (c) Determination of phenol content

   (d) Estimation of reducing & total sugar
9. Microbial production of dextran/xanthan by *Leuconostoc mesenteroides/Xanthomonas campestris.*
10. CAS assay for microbial siderophore production
11. Study of VAM fungi

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PRACTICALS OF ELECTIVE PAPER - 1

1. Preparation of different graphs using MS excel/ suitable software (line-scatter graph, column graph, bar graph with error bars, pie chart)
2. Calculate mean, median, mode, range, variance, standard deviation, standard error, confidence interval from microbiological data using MS excel/ suitable software
3. Calculate regression analysis for maltose/ glucose standard curve data using LINEST function of MS excel/ suitable software
4. Use of scientific search tools and literature citation tools (Pubmed/Google scholar/J-gate plus/ Shodhganga)

PRACTICALS OF ELECTIVE PAPER – 2

1. Calculating the Mean, median and mode, standard deviation, variance
2. Calculation of ANOVA, standard t-test, Chi-square test
3. Calculation of Regression and co-relation
4. Preparation of different charge in excel (column, bar, pie)
5. Generate Venn diagram and create a PivotChart
6. Use of scientific literature citation tools
7. Use of Scientific search tools (Pubmed/Google scholar/J-gate plus/ Shodhganga)
8. Use of Online tools for Plagiarisms checking

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16/05/2023

Patil

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MICROBIOLOGY SEM III

SKILL BASED ELECTIV PAPER -1
GE-1: BIOPROCESS ENGINEERING

1. Course Code & Title

Course code: GE-1
Course title: Bioprocess engineering
Course type: Core
Course credits: 02

2. Course overview and Course Objectives

This course is designed to impart the knowledge of principle of fermenters and its configuration. Students shall gain knowledge to design, develop, and operate industrial level fermentation process and would learn rheological behaviour of fluids and mass transfer and population dynamics in a fermentor.

Course Objectives

- To study the various aspects of bioreactor design and function of parts
- To learn the concept of fluid flow and mixing
- To gain an insight in mass transfer
- To understand the fundamentals of bioprocess monitoring and its control

3. Course Content

UNIT 1	BIOREACTOR DESIGN AND IT'S COMPONENTS
1.1	Bioreactor design
1.2	Components of bioprocess reactor
1.3	Bioreactor vessels
1.4	Gassing devices

UNIT 2	FLUID FLOWS AND MIXING
2.1	Classification of fluids
2.2	Viscosity and viscosity measurement
2.3	Non-newtonian fluids
2.4	Rheological properties of fermentation broth
2.5	Scale-up of mixing systems

UNIT 3	MASS TRANSFER
3.1	Convection mass transfer
3.2	Oxygen uptake in cell culture
3.3	Mass transfer correlation
3.4	Measurement of Kla

16/05/2023

UNIT 4	BIOPROCESS MONITORING AND CONTROL
4.1	Methods of measuring process variables
4.2	On-line analysis of other chemical factors
4.3	Control systems

Course Learning Outcomes/Student's Learning Outcomes (SLO)

Unit 1: Student will learn functioning of bioreactor
Unit 2: Student will learn fluid dynamics and its relationship with large scale fermentation mediums
Unit 3: Student will be acquainted with mass transfer during ongoing fermentation
Unit 4: Student will develop understanding about bioprocess and its control

Recommended learning resources

- Shuler M. L. and Kargi F. (2003) *Bioprocess engineering Basic concepts*, 2nd ED. Pearson education Pvt Ltd, India.
- Stanbury P.F., Whitaker A., Hall S.J., (1997) *Principles of fermentation technology*. 2nd ED, Aditya books(P) Ltd, New Delhi.
- El-mansi E.M.T and Bryce C.F.A. (2004) *Fermentation microbiology and biotechnology*, Taylor & Francis Inc, USA.
- Martin K. (2007) Ullmann's biotechnology and biochemical engineering. Vol-1&2. Wiley – VCH verlag gmbh and Co, Weinheim.
- Bailey J. S. and Bhatia S.C. (2009) Biochemical engineering. CBS publishers & distributors, India.
- Doran P.M. (2008) Bioprocess engineering principles, Academic press, California.

16/05/2023

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MICROBIOLOGY SEM III

SKILL BASED ELECTIV PAPER -2
GE-2: BIOSAFETY, BIOETHICS AND IPR

1. Course Code & Title

Course code: General Elective 2

Course title: **Biosafety, Bioethics and IPR**

Course type: Skill based elective paper

Course credits: 02

2. Course overview and Course Objectives

This course design to add knowledge regarding biosafety in arena of microbiology related field. The fundamentals of bioethics and IPR will provide students understanding about ideal practices in life sciences research and development.

Course objectives:

- To Impart knowledge of biosafety issues on microbes and genetically modified organisms
- To create awareness about regulatory bodies
- To learn various aspects of commercialization of patents
- To introduce the concept of intellectual property rights, patenting.

UNIT 1	BIOSAFETY AND ITS REGULATION
1.1	Primary containment for biohazards; biosafety levels; PPE, GRAS organisms
1.2	Biosafety levels of specific microorganisms; recommended biosafety levels for infectious agents and infected animals; definition of GMOs & LMOs
1.3	Principles of safety assessment of transgenic plants - Regulations: International regulations-Cartagena protocol
1.4	Indian regulations-EPA act and rules, guidance documents, regulatory framework: RCGM, GEAC, IBSC and other regulatory bodies

UNIT 2	BIOETHICS
2.1	Bioethics: Introduction, ethical conflicts in biological sciences-interference with nature
2.2	Bioethics in health care - patient confidentiality, informed consent, euthanasia, artificial reproductive technologies, prenatal diagnosis, genetic screening, gene therapy, transplantation
2.3	Bioethics in research - cloning and stem cell research, Human and animal experimentation, animal rights/welfare
2.4	Protection of environment and biodiversity – biopiracy

16/05/2023

UNIT 3	PATENT AND REGULATORY BODIES
3.1	Patenting: Basics of patents: types of patents; Indian Patent Act 1970; recent amendments
3.2	WIPO Treaties; Budapest Treaty; Patent Cooperation Treaty (PCT) and implications
3.3	Procedure for filing a PCT application
3.4	Patent application forms and guidelines including those of National Bio-diversity Authority (NBA) and other regulatory bodies

UNIT 4	COMMERCIALIZATION OF PATENT AND ROYALTY
4.1	Patent infringement- meaning, scope, litigation, case studies and examples
4.2	Commercialization of patented innovations
4.3	Licensing-outright sale
4.4	Licensing, royalty
4.5	Patenting by research students and scientists-university/organizational rules in India and abroad

4. Course Learning Outcomes/Student's Learning Outcomes (SLO)

Unit 1: Students shall understand importance of Personnel Protective Equipment (PPE), general biosafety rules and different biosafety levels

Unit 2: Students shall gain knowledge of the regulatory agencies for working products derived from biotechnology

Unit 3: Students will gain an understanding on ethical issues involving biological material

Unit 4: Students shall develop an understanding intellectual property right and their implications in biological research and product development

Recommended learning resources

1. International Union for the Protection of New Varieties of Plants. http://www.upov.int
2. National Portal of India. http://www.archive.india.gov.in
3. Parashar S, Goel D (2013) IPR, Biosafety and Bioethics Pearson Publishing India, ISBN: 9788131774700.
4. Nambisan P (2017) An Introduction to Ethical, Safety and Intellectual Property Rights Issues in Biotechnology. Academic Press, ISBN: 9780128092316.
5. http://dbtindia.gov.in/guidelines-biosafety
6. Office of the Controller General of Patents, Design & Trademarks; Department of Industrial Policy & Promotion; Ministry of Commerce & Industry; Government of India. http://www.ipindia.nic.in/
7. World Trade Organisation. http://www.wto.org
8. World Intellectual Property Organisation. http://www.wipo.int

16/05/2023

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MICROBIOLOGY SEM III

SKILL BASED ELECTIVE PAPER-3
GE-3: ADVANCES IN DIAGNOSTIC MICROBIOLOGY

1. Course Code & Title

Course code: **GE-3** (MB 3005)
Course title: Advances in diagnostic microbiology
Course type: Skill based elective paper
Course credits: 02

2. Course overview and Course Objectives

Diagnostic microbiology field continues to undergo a quiet revolution that already has resulted in many benefits for microbiologists, clinicians, and most importantly patients. This revolution was made possible by the use of advanced technologies. The objective of this paper is to introduce students a comprehensive, well-referenced, and up-to-date description of these rapidly evolving advanced methods for the diagnosis of infectious diseases in the routine clinical as well as research microbiology laboratory.

Course Objectives

- To study the methods for the cultivation and identification of antimicrobial activity.
- To learn the methods for the identification of parasitic, mycological and viral pathogens
- To gain an insight of molecular techniques used in identification of microbial agents
- To understand the advancement in clinical diagnosis of diseases.

3. Course Content

UNIT 1	DIAGNOSIS OF INFECTIOUS DISEASES AND EVALUATION OF ANTIMICROBIAL ACTIVITY
1.1	Traditional cultivation and identification
1.2	Nucleic acid based analytic methods for microbial identification and characterization
1.3	Immunochemical methods used for organism detection
1.4	Serologic diagnosis of infectious diseases
1.5	Laboratory methods and strategies for antimicrobial susceptibility testing

UNIT 2	LABORATORY METHODS FOR INFECTIOUS MICROBES
2.1	Overview of bacterial identification methods and strategies
2.2	Laboratory methods for diagnosis of parasitic infections
2.3	Laboratory methods in basic Mycology
2.4	Laboratory methods in basic Virology

16/05/2023

UNIT 3	ADVANCED LABORATORY DIAGNOSTIC TECHNIQUES - 1
3.1	Molecular Typing Techniques
3.2	PCR and Its Variations
3.3	Gel Electrophoresis, Southern Blot, and Colorimetric Microwell Plate-Based System Direct Nucleotide Sequencing for Amplification Product Identification
3.4	Microarray-Based Amplification Product Detection and Identification
3.5	

UNIT 4	ADVANCED LABORATORY DIAGNOSTIC TECHNIQUES - 2
4.1	Cellular Fatty Acid-Based Microbial Identification and Antimicrobial Susceptibility Testing
4.2	MALDI-TOF Mass Spectrometry-Based Microbial Identification
4.3	Nonamplified Probe-Based Microbial Detection and Identification
4.4	Microbial Identification by PCR/Electrospray Ionization-Mass Spectrometry
4.5	Bacterial Identification Based on Universal Gene Amplification and Sequencing

STUDENTS LEARNING OUTCOMES:

After successful completion of the course student will be able to

- Develop the skills for the application of basic and advanced techniques employed in Diagnostic Microbiology
- Use selected diagnostic techniques
- Familiar with working, principles, tools and techniques of Diagnostic Microbiology and creative use of advanced techniques in diagnosis of microbial diseases.

4. Course Learning Outcomes/Student's Learning Outcomes (SLO)

Unit 1: Students shall understand the application of basic techniques in

Unit 2: Students shall gain knowledge of usage of diagnostic techniques

Unit 3: Students will gain an understanding working, principles, tools and techniques of diagnostic Microbiology and creative use of advanced techniques in diagnosis of microbial diseases.

Unit 4: Students shall develop an understanding of advanced techniques of microbial diagnosis

Recommended learning resources

- Betty A Forbes, Daniel F Sahm and Alice S Weissfeld (2007), *Bailey & Scott's Diagnostic Microbiology*, 12th ed., Elsevier, ISBN: 9780070604605.
- Yi-Wei Tang and Charles W Stratton (2013), *Advanced Techniques in Diagnostic Microbiology*, 2nd ed., Springer, ISBN: 978-1-4614-3970-7 (eBook).

16/05/2023

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MICROBIOLOGY SEM III

SKILL BASED ELECTIVE PAPER-3
GE-4: MATHEMATICS AND GENERAL APTITUDE SKILLS

1. Course Code & Title

Course code: **GE-3** (MB 3005)
Course title: Mathematics and General Aptitude Skills
Course type: Skill based elective paper
Course credits: 02

2. Course overview and Course Objectives

Course is designed with the all aptitude skills which included in the UGC-NET and CSIR-NET along with the GSET examination syllabus. Students will get the details methods and techniques to solve sixteen different mathematical and general aptitude skills.

Course Objectives

- To study the essential mathematical problems and Numerical Ability.
- To develop an understanding various daily life and geometrical life problems
- To offer the deep perceptions into the mathematical problems, numerical ability, daily life and geometrical life problems.

3. Course Content

UNIT 1	TYPICAL PROBLEMS
1.1	Calendar problems
1.2	Clock problems
1.3	Moving locomotive problems
1.4	Series formation

UNIT 2	NUMERICAL ABILITY
2.1	Numbers
2.2	Probability and arrangement
2.3	Coding -decoding
2.4	Distance and direction

UNIT 3	DAILY LIFE PROBLEMS
3.1	Finding the x
3.2	Average and percentage
3.3	Monetary problems

UNIT 4	GEOMETRICAL LIFE PROBLEMS
4.1	Geometry

16/05/2023

4.2 4.3	Mensuration and quantitative comparison Puzzles

After successful completion of the course student will be able to

4. Course Learning Outcomes/Student's Learning Outcomes (SLO)

Unit 1: Students shall acquire the essential knowledge useful to solve the problems of mathematics understand the application

Unit 2: Students shall gain an understanding of basic arithmetical operations such as additions, reduction, multiply, and divisions constitute basic numeracy abilities

Unit 3: Students shall get acquainted with daily life problems

Unit 4: Students shall develop logical reasoning and aptitude skill to solve the real geometrical life problems.

Recommended learning resources

- CSIR-NET General Aptitude - A New Outlook, by Christy Varghese, 2018, ISBN: 97881922911109, LIlly Publishing; Sixth edition
- CSIR NET General Aptitude (Part-A) 2023 - Comprehensive Theory & Practice Book, by Kailash Choudhary, ISBN: 8194843731, IFAS Publications; 4th edition, 2021
- CSIR-UGC-NET General Aptitude, Ram Mohan Pandey, 2022, Pathfinder Publication, ISBN: 978-93-80473-05-5

16/05/2023

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