MODULE DETAILS

Module 1: "Hands-on Industrial Training with State of Art Lectures on Advanced Biotech Techniques *i.e.* Mixed Module" (Program Code: CRT-01).
(THIS IS OUR MOST EFFECTIVE MODULE)

Mixed Module* (Includes the techniques from Microbiology/Molecular Biology/ Biochemical -Proteomics/Enzymology & RDT)

NOTE: For **Project/ Dissertation works**, Please see **Module-12**.

Techniques Details: (For Duration of 30 Days)

S. No.	Lab Schedule
1	Bio-Instrumentation for Wet Lab.
2	Media Preparation & Culturing of Microbes.
3	Pure Culture of Microbes through Streaking Method.
4	Primary & Secondary Screening of Microbes.
5	Growth Kinetic Studies of Microbes.
6	Antibiotics Sensitivity Test.
7	Minimum Inhibitory Concentration (MIC) Test.
8	Genomic DNA Isolation. (A) DNA Isolation from Microbes. (B) DNA Isolation from Plant Sample.
9	Agarose Gel Electrophoresis for Genomic DNA.
10	RNA Isolation from Plant Samples.
11	Denaturing Gel Electrophoresis of RNA.
12	Qualitative Analysis of Nucleic Acid.
13	Quantitative Analysis of Nucleic Acid.
14	Protein Isolation & Buffer Preparation.
15	SDS-PAGE.
16	Blotting Techniques. (A) Southern/Northern Blotting. (B) Western Blotting.
17	Restriction Digestion.
18	Ligation.
19	Competent Cell Preparation.
20	Transformation.
21	Blue-White Screening.
22	Cloning & Gene expression.
23	Polymerase Chain Reaction (PCR).
24	Electrophoresis of PCR Products.
25	Estimation of Protein by Bradford Method.
26	Estimation of Protein by Lowry's Method.
27	Enzyme Assays.
28	Fermentation & Downstream Processing (DSP).
29	Chromatography Techniques.

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Techniques Details: (For Duration of 15 Days)

S. No.	Lab Schedule
1	Bio-Instrumentation for Wet Lab.
2	Media Preparation & Culturing of Microbes.
3	Pure Culture of Microbes through Streaking Method.
4	Primary & Secondary Screening of Microbes.
5	Antibiotics Sensitivity Test.
6	Minimum Inhibitory Concentration (MIC) Test.
7	Genomic DNA Isolation. (A) DNA Isolation from Microbes. (B) DNA Isolation from Plant Sample.
8	Agarose Gel Electrophoresis for Genomic DNA.
9	Qualitative Analysis of Nucleic Acid.
10	Quantitative Analysis of Nucleic Acid.
11	Protein Isolation & Buffer Preparation.
12	SDS-PAGE.
13	Southern/Northern Blotting.
14	Restriction Digestion.
15	Estimation of Protein by Bradford/Lowry's Method.
16	Enzyme Assay.
17	Polymerase Chain Reaction (PCR).
18	Electrophoresis of PCR Products.

Module 2: "Hands-on Industrial Training with State of Art Lectures on Basic & Advanced Industrial Microbiology" (Program Code: CRT-02).

Techniques Details: (For Duration of 30 Days)

S. No.	Lab Schedule
1	General and Safety Instructions for Working in Microbiology Lab.
2	Bio-Instrumentation for Wet Lab.
3	Working with Autoclave, Hot-Air Oven, Laminar Air Flow, Microscope and other Microbiological Laboratory Instruments.
4	Handling of Micropipettes, Petri plates, Spreaders, Inoculation Loop and other Microbiological Tools.
5	Identification and Classification of Microbes.
6	Culturing of Microbes.
7	Types of Culture Media.
8	Media Preparation.
9	Solid and Liquid Media Preparation.
10	Preparation of Cotton Plug, Plugging for Bacterial Cultures.
11	Sterilization Process.
12	Chemical Sterilization Process.
13	Physical Sterilization Process.

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14	Pouring of Media on Plates.
15	Isolation and Culturing of Microbes from Soil Sample (Through Serial Dilution Method).
16	Isolation and Culturing of Microbes from Water Sample (Through Serial Dilution Method).
17	Isolation and Culturing of Microbes from Air (Through Exposure Method).
18	Pure Culture Technique.
19	Pour Plate Technique.
20	Spread Plate Technique.
21	Various Streaking Methods.
22	Pure Culture Preparation through Solid Media.
23	Maintenance of Pure Culture.
24	Slant Preparation & Sub Culturing of Microbes.
25	Morphological Behaviour of Microbes.
26	Staining Techniques. (A) Gram Staining. (B) Endospore Staining.
27	Biochemical Tests. (A) Catalase Test. (B) Mannitol Fermentation Test. (C) VP Test etc.
28	Optimization of Culture Conditions of Microbes.
29	Study of Growth Pattern of Microbes.
30	Effect of pH, Temperature, Salinity, Precursors, Inhibitors and Elicitors on Growth of Microbes.
31	Effect of Physical and Chemical Mutagen on Growth of Microbes.
32	Primary Screening of Active Microbes.
33	Secondary Screening of Active Microbes.
34	Fermentation Techniques.
35	Isolation and Characterization of Antibiotics from Microbes.
36	Antibiotics Sensitivity Test.
37	Evaluation and Determination of Minimum Inhibitory Concentration (MIC).

Techniques Details: (For Duration of 15 Days)

S. No.	Lab Schedule
1	General and Safety Instructions for working in Microbiology Lab.
2	Bio-Instrumentation for Wet Lab.
3	Working with Autoclave, Hot-Air Oven, Laminar Air Flow, Microscope and other Microbiological Laboratory Instruments.
4	Handling of Micropipettes, Petri plates, Spreaders, Inoculation Loop and other Microbiological Tools.
5	Isolation, Identification and Classification of Microbes.
6	Culturing of Microbes.
7	Types of Culture Media.
8	Media Preparation.
9	Solid and Liquid Media Preparation.
10	Preparation of Cotton Plug, Plugging for Bacterial Cultures.
11	Sterilization Process.

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12	Chemical Sterilization Process.
13	Physical Sterilization Process.
14	Pouring of Media on Plates.
15	Isolation and Culturing of Microbes from Soil Sample (Through Serial Dilution Method).
16	Isolation and Culturing of Microbes from Water Sample (Through Serial Dilution Method).
17	Isolation and Culturing of Microbes from Air (Through Exposure Method).
18	Pure Culture Technique.
19	Pour Plate Technique.
20	Spread Plate Technique.
21	Various Streaking Methods.
22	Maintenance of Pure Culture.
23	Slant Preparation & Sub Culturing of Microbes.
24	Staining Techniques. (A) Gram Staining. (B) Endospore Staining.
25	Study of Growth Pattern of Microbes.
26	Effect of pH, Temperature, Inhibitors and Elicitors on Growth of Microbes.

Module 3: "Hands-on Industrial Training with State of Art Lectures on Basic & Advanced Molecular Biology" (Program Code: CRT-03).

Techniques Details: (For Duration of 30 Days)

S. No.	Lab Schedule
1	Working in Molecular Biology Laboratory.
2	General and Safety Instructions.
3	Good Laboratory Practices.
4	Principle and Handling of Laboratory Equipments.
5	Basics of Calculations, Weighing and Measurements.
6	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
7	Process of Sterilization and Decontamination.
8	Extraction and Purification of Genomic DNA from Various Parts of Plants.
9	Electrophoresis of Genomic DNA.
10	Calculation of Yield of DNA per gram of Plant Material.
11	Determination of Contaminants and Concentration of DNA by Spectrophotometer.
12	Extraction and Purification of Genomic DNA from Microbes.
13	Electrophoresis of Genomic DNA.
14	Determination of Purity of Bacterial Genomic DNA.
15	Determination of Contaminants and Concentration of Genomic DNA by Spectrophotometer.
16	Extraction and Purification of Plasmid DNA from *E. coli.*
17	Electrophoresis of Plasmid DNA.
18	Determination of Purity of Plasmid DNA.
19	Determination of Contaminants and Concentration of Plasmid DNA by Spectrophotometer.

20	RNA Extraction from Plants.
21	Extraction and Purification of RNA from Various Plant Materials.
22	Denaturing Gel Electrophoresis of RNA.
23	Determination of Purity of RNA.
24	Southern Blotting for DNA.
25	Northern Blotting for RNA.
26	Restriction Digestion of DNA by Restriction Endonucleases.
27	Separation of Digestion Fragments by Electrophoresis.
28	Ligation of Restriction Fragments into Plasmid.
29	Competent Cell Preparation.
30	Transfer of DNA into *E. coli*.
31	Screening of the Transformed Cells.
32	Blue-White Selection of Bacterial Colonies.
33	Polymerase Chain Reaction (PCR).
34	Electrophoresis of PCR Products.

Techniques Details: (For Duration of 15 Days)

S. No.	Lab Schedule
1	Working in Molecular Biology Laboratory.
2	General and Safety Instructions.
3	Good Laboratory Practices.
4	Principle and Handling of Laboratory Equipments.
5	Basics of Calculations, Weighing and Measurements.
6	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
7	Process of Sterilization and Decontamination.
8	Extraction and Purification of Genomic DNA from Various Parts of Plants.
9	Electrophoresis of Genomic DNA.
10	Calculation of Yield of DNA per gram of Plant Material.
11	Determination of Contaminants and Concentration of DNA by Spectrophotometer.
12	Extraction and Purification of Genomic DNA from Microbes.
13	Electrophoresis of Genomic DNA.
14	Determination of Purity of Bacterial Genomic DNA.
15	Determination of Contaminants and Concentration of Genomic DNA by Spectrophotometer.
16	Extraction and Purification of Plasmid DNA from *E. coli*.
17	Electrophoresis of Plasmid DNA.
18	Determination of Purity of Plasmid DNA.
19	Determination of Contaminants and Concentration of Plasmid DNA by Spectrophotometer.
20	Polymerase Chain Reaction (PCR)
21	Electrophoresis of PCR Products.

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Module 4: "Hands-on Industrial Training with State of Art Lectures on Basic & Advanced Biochemical Techniques & Proteomics" (Program Code: CRT-04).

Techniques Details: (For Duration of 30 Days)

S. No.	Lab Schedule
1	General and Safety Instructions.
2	Good Laboratory Practices.
3	Principle and Handling of Laboratory Equipments.
4	Basics of Calculations, Weighing and Measurements.
5	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
6	Process of Sterilization and Decontamination.
7	Isolation of Proteins from Plants and Microbial Systems.
8	Extraction of Total Protein from Various Parts of Plants.
9	Partial Purification of Plant Proteins by Precipitation Method.
10	Calculation of Yield of Protein per gram of Plant Material by Bradford's Method.
11	Calculation of Yield of Protein per gram of Plant Material by Lowry's Method.
12	Separation and Characterisation of Various Proteins.
13	SDS-PAGE.
14	Western Blotting for Purified Proteins.
15	Extraction and Estimation of Bioactive Compounds from Various Plants.
16	Determination of Potency of Bioactive Compounds.
17	Extraction of Antibiotics from Active Microbes.
18	Determination of Efficacy and Potency of Antibiotics.
19	Fermentation.
20	Downstream Processing (DSP).
21	Salt Precipitation.
22	Dialysis.
23	Solvent Precipitation.
24	Paper Chromatography.
25	Column Chromatography.
26	Thin Layer Chromatography (TLC).

Techniques Details: (For Duration of 15 Days)

S. No.	Lab Schedule
1	General and Safety Instructions.
2	Good Laboratory Practices.
3	Principle and Handling of Laboratory Equipments.
4	Basics of Calculations, Weighing and Measurements.
5	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
6	Process of Sterilization and Decontamination.
7	Isolation of Proteins from Plants and Microbial Systems.
8	Extraction of Total Protein from Various Parts of Plants.
9	Partial Purification of Plant Proteins by Precipitation Method.
10	Calculation of Yield of Protein per gram of Plant Material by Bradford's Method.
11	SDS-PAGE.
12	Extraction and Estimation of Bioactive Compounds from Various Plants.

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13	Determination of Potency of Bioactive Compounds.
14	Solvent Precipitation.
15	Paper Chromatography.
16	Thin Layer Chromatography (TLC).

Module 5: "Hands-on Industrial Training with State of Art Lectures on Enzymology" (Program Code: CRT-05).

Techniques Details: (For Duration of 30 Days)

S. No.	Lab Schedule
1	General and Safety Instructions.
2	Good Laboratory Practices.
3	Principle and Handling of Laboratory Equipments.
4	Basics of Calculations, Weighing and Measurements.
5	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
6	Process of Sterilization and Decontamination.
7	Introduction to Enzymology.
8	Pure Culture Preparation.
9	Screening of Putative Cultures for Enzyme Production.
10	Fermentation (Submerged & Solid State).
11	Downstream Processing (DSP).
12	Extraction of Crude Enzyme.
13	Partial Purification of Enzyme.
14	Precipitation of Enzyme (Salt & Solvent).
15	Dialysis.
16	Characterization of Purified Enzyme.
17	Total Protein Estimation.
18	Bradford's Method.
19	Lowry's Method.
20	Enzyme Assay.
21	Enzyme Kinetics.
22	Effect of pH on Enzyme Activity.
23	Effect of Temperature on Enzyme Activity.
24	Effect of Substrate Concentration on Enzyme Activity.
25	Effect of Activator on Enzyme Activity.
26	Effect of Inhibitor on Enzyme Activity.
27	SDS PAGE.

Techniques Details: (For Duration of 15 Days)

S. No.	Lab Schedule
1	General and Safety Instructions.
2	Good Laboratory Practices.
3	Principle and Handling of Laboratory Equipments.
4	Basics of Calculations, Weighing and Measurements.

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5	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
6	Process of Sterilization and Decontamination.
7	Introduction to Enzymology.
8	Pure Culture Preparation.
9	Screening of Putative Cultures for Enzyme Production.
10	Fermentation (Submerged & Solid State).
11	Downstream Processing (DSP).
12	Extraction of Crude Enzyme.
13	Partial Purification of Enzyme.
14	Precipitation of Enzyme by Solvent Method.
15	Enzyme Assay.
16	Effect of pH on Enzyme Activity.
17	Effect of Temperature on Enzyme Activity.
18	Total Protein Estimation by Bradford's Method.

Module 6: "Hands-on Industrial Training with State of Art Lectures on Recombinant DNA Technology (RDT)" (Program Code: CRT-06).

Techniques Details: (For Duration of 30 Days)

S. No.	Lab Schedule
1	Working in Molecular Biology Laboratory.
2	General and Safety Instructions.
3	Good Laboratory Practices.
4	Principle and Handling of Laboratory Equipments.
5	Basics of Calculations, Weighing and Measurements.
6	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
7	Process of Sterilization and Decontamination.
8	DNA Extraction from Microbes.
9	Purification of Genomic DNA from Several Microbes.
10	Calculation of Yield of Genomic DNA per Bacterium.
11	Determination of Contaminants and Concentration of Genomic DNA by Spectrophotometer.
12	Isolation of Plasmid.
13	Extraction and Purification of Plasmid DNA from *E. coli.*
14	Electrophoresis of Plasmid DNA.
15	Determination of Purity of Plasmid DNA.
16	Calculation of Yield of Plasmid DNA per Bacterium.
17	Determination of Contaminants and Concentration of Plasmid DNA by Spectrophotometer.
18	Restriction Digestion of Plasmid DNA by Restriction Endonucleases.
19	Separation of Digestion Fragments by Electrophoresis.
20	Construction of Recombinant DNA Molecule.
21	Ligation of Restriction Fragments into Plasmid.
22	Transformation of Recombinant Plasmid in *E. coli.*
23	Competent Cell Preparation.
24	Transfer of DNA by Heat-Shock Method.

25	Screening of the Transformed Cells.
26	Blue-White Selection of Bacterial Colonies.
27	Analysis of Target Gene.
28	Gene Expression Study in *E. coli*.
29	Extraction and Purification of Ultra Pure PCR Grade DNA from Various Sources.
30	Determination of Purity of PCR Grade DNA.
31	Determination of Concentration of DNA & Dilution to Unity for PCR.
32	Polymerase Chain Reaction (PCR).
33	Optimization of Protocol for PCR.
34	Principle, Handling & Precautions of PCR Machine.
35	Electrophoresis of PCR Products.

Module 7: "Hands-on Industrial Training with State of Art Lectures on Basic Biotech Techniques *i.e.* Mixed module" (Program Code: CRT-07).

Techniques Details: (For Duration of 30 Days/ 1 Month)

S. No.	Lab Schedule
	Section-A : Bio-Instrumentations.
1	Introduction to Biotechnology and Allied Fields.
2	Introduction to General Lab Rules and Sterilization Techniques.
3	Handling and Operation of Bio-Instruments such as- Digital Weighing Balance, Micro- controller pH Meter, Digital pH Meter, Autoclave, Centrifuge Machine, Distillation Unit, Bacterial Incubator, Hot Air Oven, Water Bath, Shaker Incubator, BOD Incubator, Micro-Pipettes, Vortex Mixer, Magnetic Stirrer, Hot Plate Stirrer, Microscope, Colorimeter, White Light Transilluminator & Laminar Air Flow.
4	Operating Highly Sophisticated Instruments such as Electrophoresis Units (Horizontal & Vertical), Digital UV-Visible PC based Spectrophotometer, Blotting Apparatus, UV Transilluminator, Thermal Cycler (PCR Machine) & Gel Doc. System.
	Section-B : Industrial Microbiology & Fermentation Technology.
5	Basics of Calculations, Weighing and Measurements.
6	Process of Sterilization and Decontamination.
7	Media Preparation.
8	Pouring & Plugging for Bacterial Cultures.
9	Isolation and Culturing of Microbes from Soil Sample (Through Serial Dilution Method).
10	Isolation and Culturing of Microbes from Water Sample (Through Serial Dilution Method).
11	Isolation and Culturing of Microbes from Air (Through Exposure Method).
12	Pure Culture of Microbes through Streaking Method.
13	Slant Preparation & Sub Culturing of Microbes.
14	Staining Techniques.
15	Fermentation (Submerged & Solid State).
16	Downstream Processing (DSP).
	Section-C : Molecular Biology & Proteomics.

17	Working in Molecular Biology Laboratory.
18	General and Safety Instructions.
19	Good Laboratory Practices.
20	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
21	LB-Media Preparation, Inoculation and Culturing of *E. coli*.
22	Plasmid Isolation from *E. coli*.
23	DNA Isolation from Plant Sample.
24	Agarose Gel Electrophoresis for Plasmid/Genomic DNA.
25	Restriction Digestion.
26	Isolation of Proteins from Plants and Microbial Systems.
27	Extraction of Total Protein from Various Parts of Plants.
28	Partial Purification of Plant Proteins by Precipitation Method.
29	Total Protein Estimation by Bradford's Method.
30	Paper Chromatography.
31	Thin Layer Chromatography (TLC).

Module 8: "Hands-on Industrial Training with State of Art Lectures on HPLC, PCR & Gel Doc System" (Program Code: CRT-08).

Techniques Details: (For Duration of 15 Days)

S. No.	(HPLC)
1	Introduction to Separation Techniques.
2	Introduction to Chromatographic Techniques.
3	Types of Chromatographic Techniques.
4	Explanation of Titrimetric Calculations.
5	Introduction to HPLC Components.
6	Types of Pumps and Functions of their Components.
7	Reservoirs and their Uses.
8	Types of Injectors & their Functions.
9	Types of Detectors & their Functions.
10	Types of Mobile Phase to Separate the Compounds.
11	Types of Stationary Phase to Separate the Compounds.
12	Types of Column.
13	Preparation of Mobile Phase to Separate the Compounds.
14	Method Development for the Separation of Unknown Compounds.
15	How to Select the Mobile Phase.
16	How to Select the Stationary Phase.
17	How to Select the Flow Rate.
18	How to Select the Gradient & Isocratic Methods.
19	How to Select the Sample Volume.
20	How to Select the Wave Lengths or Detectors.
21	Discussions.
	(PCR)
1	Extraction and Purification of Ultra Pure PCR Grade DNA from Plants.
2	Electrophoresis of Genomic DNA.
3	Calculation of Yield of DNA per gram of Plant Material.

4	Determination of Purity of PCR Grade DNA.
5	Determination of Concentration of DNA & Dilution to Unity for PCR.
6	Polymerase Chain Reaction (PCR)
7	Optimization of Protocol for PCR.
8	Principle, Handling & Precautions of PCR Machine.
9	Electrophoresis of PCR Products.
10	Discussions.
	(Gel Doc System)
1	Principle, Handling & Precautions of Gel Doc.
2	Composed Components & their Functions.
3	Imaging and Documentation of Nucleic Acid and Protein.
4	Applications of Gel Doc System.
5	Discussion.

Module 9: "Hands-on Industrial Training with State of Art Lectures on Specialized Biotech Techniques" (Program Code: CRT-09).
(THIS IS OUR SECOND MOST EFFECTIVE AS WELL AS JOB ORIENTED* MODULE)

Techniques Details: (For Duration of 45 Days)

S. No.	Lab Schedule
1	Bio-Instrumentation for Wet Lab.
2	Antibiotics Sensitivity Test.
3	Minimum Inhibitory Concentration (MIC) Test.
4	MDR Test.
5	RNA Isolation from Plant Samples.
6	Denaturing Gel Electrophoresis of RNA.
7	Quantitative Analysis of Nucleic Acid.
8	SDS-PAGE.
9	Blotting Techniques. (A) Southern/Northern Blotting. (B) Western Blotting.
10	Extraction and Purification of Plasmid DNA from *E. coli.*
11	Restriction Digestion.
12	Ligation.
13	Competent Cell Preparation.
14	Transformation.
15	Blue-White Screening.
16	Cloning & Gene expression.
17	Extraction and Estimation of Bioactive Compounds from Various Plants.
18	Extraction of Antibiotics from Active Microbes.
19	Downstream Processing (DSP).
20	Salt Precipitation.
21	Dialysis.
22	**Polymerase Chain Reaction (PCR/Thermal Cycler)**
22-A	Extraction and Purification of Ultra Pure PCR Grade DNA from Plants.
22-B	Electrophoresis of Genomic DNA.

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22-C	Calculation of Yield of DNA per gram of Plant Material.
22-D	Determination of Purity of PCR Grade DNA.
22-E	Determination of Concentration of DNA & Dilution to Unity for PCR.
22-F	Polymerase Chain Reaction (PCR)
22-G	Optimization of Protocol for PCR.
22-H	Principle, Handling & Precautions of PCR Machine.
22-I	Electrophoresis of PCR Products.
22-J	Discussions.
23	**Gel Documentation System (Gel Doc/Gel Imager)**
23-A	Principle, Handling & Precautions of Gel Doc.
23-B	Composed Components & their Functions.
23-C	Imaging and Documentation of Nucleic Acid and Protein.
23-D	Applications of Gel Doc System.
23-E	Discussion.
24	Chromatographic Techniques.
24-A	Paper Chromatography.
24-B	Thin Layer Chromatography (TLC).
24-C	Column Chromatography.
25	**High Performance Liquid Chromatography (HPLC)**
25-A	Introduction to HPLC Components.
25-B	Types of Pumps and Functions of their Components.
25-C	Reservoirs and their Uses.
25-D	Types of Injectors & their Functions.
25-E	Types of Detectors & their Functions.
25-F	Types of Mobile Phase to Separate the Compounds.
25-G	Types of Stationary Phase to Separate the Compounds.
25-H	Types of Column.
25-I	Preparation of Mobile Phase to Separate the Compounds.
25-J	Method Development for the Separation of Unknown Compounds.
25-K	How to Select the Mobile Phase.
25-L	How to Select the Stationary Phase.
25-M	How to Select the Flow Rate.
25-N	How to Select the Gradient & Isocratic Methods.
25-O	How to Select the Sample Volume.
25-P	How to Select the Wave Lengths or Detectors.
25-Q	Discussions.

Techniques Details: (For Duration of 60 Days*)

S. No.	Lab Schedule
1	Working in Research Laboratory.
2	General and Safety Instructions.
3	Good Laboratory Practices.
4	Principle and Handling of Laboratory Equipments.
5	Basics of Calculations, Weighing and Measurements.
6	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
7	Process of Sterilization and Decontamination.
8	Culturing of Microbes.
9	Types of Culture Media.

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10	Media Preparation.
11	Solid and Liquid Media Preparation.
12	Pure Culture Technique.
13	Pour Plate Technique.
14	Spread Plate Technique.
15	Various Streaking Methods.
16	Antibiotics Sensitivity Test.
17	Minimum Inhibitory Concentration (MIC) Test.
18	MDR Test.
19	RNA Isolation from Plant Samples.
20	Denaturing Gel Electrophoresis of RNA.
21	Quantitative Analysis of Nucleic Acid.
22	SDS-PAGE.
23	Blotting Techniques. (A) Southern/Northern Blotting. (B) Western Blotting.
24	Extraction and Purification of Plasmid DNA from *E. coli.*
25	Restriction Digestion.
26	Ligation.
27	Competent Cell Preparation.
28	Transformation.
29	Blue-White Screening.
30	Cloning & Gene expression.
31	Extraction and Estimation of Bioactive Compounds from Various Plants.
32	Extraction of Antibiotics from Active Microbes.
33	Downstream Processing (DSP).
34	Salt Precipitation.
35	Dialysis.
36	**Polymerase Chain Reaction (PCR/Thermal Cycler)**
36-A	Extraction and Purification of Ultra Pure PCR Grade DNA from Plants.
36-B	Electrophoresis of Genomic DNA.
36-C	Calculation of Yield of DNA per gram of Plant Material.
36-D	Determination of Purity of PCR Grade DNA.
36-E	Determination of Concentration of DNA & Dilution to Unity for PCR.
36-F	Polymerase Chain Reaction (PCR)
36-G	Optimization of Protocol for PCR.
36-H	Principle, Handling & Precautions of PCR Machine.
36-I	Electrophoresis of PCR Products.
36-J	Discussions.
37	**Gel Documentation System (Gel Doc/Gel Imager)**
37-A	Principle, Handling & Precautions of Gel Doc.
37-B	Composed Components & their Functions.
37-C	Imaging and Documentation of Nucleic Acid and Protein.
37-D	Applications of Gel Doc System.
37-E	Discussion.
38	Chromatographic Techniques.
38-A	Paper Chromatography.
38-B	Thin Layer Chromatography (TLC).
38-C	Column Chromatography.
39	**High Performance Liquid Chromatography (HPLC)**

39-A	Introduction to HPLC Components.
39-B	Types of Pumps and Functions of their Components.
39-C	Reservoirs and their Uses.
39-D	Types of Injectors & their Functions.
39-E	Types of Detectors & their Functions.
39-F	Types of Mobile Phase to Separate the Compounds.
39-G	Types of Stationary Phase to Separate the Compounds.
39-H	Types of Column.
39-I	Preparation of Mobile Phase to Separate the Compounds.
39-J	Method Development for the Separation of Unknown Compounds.
39-K	How to Select the Mobile Phase.
39-L	How to Select the Stationary Phase.
39-M	How to Select the Flow Rate.
39-N	How to Select the Gradient & Isocratic Methods.
39-O	How to Select the Sample Volume.
39-P	How to Select the Wave Lengths or Detectors.
39-Q	Discussions.

Module 10: "Hands-on Industrial Training with State of Art Lectures on Bioprocess Engineering/ Bioprocess Technology/ Fermentation Technology/" (Program Code: CRT-10).

(MOST EFFECTIVE MODULE as per INDUSTRIAL DEMAND)

Techniques Details: (For Duration of 30 Days)

S. No.	Lab Schedule
1	General and Safety Instructions.
2	Good Laboratory Practices.
3	Principle and Handling of Laboratory Equipments.
4	Basics of Calculations, Weighing and Measurements.
5	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
6	Process of Sterilization and Decontamination.
7	Isolation and Purification of Bacteria from Soil.
8	Screening of Purified Cultures for Amylase Production. (A) Primary Screening (B) Secondary Screening
9	Optimization of Physiochemical Factors for Maximum Production of Amylases. (A) pH (B) Temperature (C) Incubation Time (D) Substrate Concentration (E) Carbon Source (F) Nitrogen Source
10	Introduction to Fermentation Processes.
11	Design of Fermenter & Types.
12	Sterilization of Fermenter.

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	(A) Sterilization of pH probe (B) Sterilization of DO probe (C) Sterilization of culture vessel (D) Sterilization of optimized media (E) Sterilization of connectors and loops (F) Sterilization of syringe
13	Inoculum Development.
14	Instrumentation & Process Control. (A) Connection of pH probe (B) Connection of DO probe (C) Connection of air pump (D) Optimized pH setting (E) Optimized DO setting (F) Optimized temperature setting
15	Production of Amylase. (A) Submerged fermentation (Batch). (B) Solid state fermentation.
16	Downstream Processes. (A) Preparation of Cell Free Extract. (B) Precipitation of Enzyme. (C) Dialysis.
17	Determination of Specific activity. (A) Total activity calculation by DNS Method. (B) Total Protein estimation by Lowry's Method.
18	Characterization of Purified Enzyme. (A) pH (B) Temperature (C) Activators (D) Inhibitors
19	Determination of Molecular Weight of Purified Enzyme by SDS PAGE.

Techniques Details: (For Duration of 15 Days)

S. No.	Lab Schedule
1	General and Safety Instructions.
2	Good Laboratory Practices.
3	Principle and Handling of Laboratory Equipments.
4	Basics of Calculations, Weighing and Measurements.
5	Preparation of Reagents, Stock Solutions & Methods of Labelling and Storage.
6	Process of Sterilization and Decontamination.
7	Isolation and Purification of Bacteria from Soil.
8	Screening of Purified Cultures for Amylase Production. (A) Primary Screening (B) Secondary Screening
9	Introduction to Fermentation Processes.
10	Pre-fermentation studies. (A) Optimization of temperature (B) Optimization of pH
11	Sterilization of Fermenter. (A) Sterilization of pH probe

	(B) Sterilization of DO probe (C) Sterilization of culture vessel (D) Sterilization of optimized media (E) Sterilization of connectors and loops (F) Sterilization of syringe
12	Inoculum Development.
13	Instrumentation & Process Control. (A) Connection of pH probe (B) Connection of DO probe (C) Connection of air pump (D) Optimized pH setting (E) Optimized DO setting (F) Optimized temperature setting
14	Production of Amylase by submerged fermentation.
15	Determination of Total Enzyme activity.

Module 11: "Hands-on Industrial Training with State of Art Lectures on Genomics & Proteomics" (Program Code: CRT-11).

Techniques Details: (For Duration of 30 Days)

SL. No	**Section A: (Genomics)**
	(PCR)
1	Extraction and Purification of Ultra Pure PCR Grade DNA.
2	Electrophoresis of Genomic DNA.
3	Calculation of Yield of DNA.
4	Determination of Purity of PCR Grade DNA.
5	Determination of Concentration of DNA.
6	Preparation of DNA for PCR.
7	Programming of PCR protocol in Thermal Cycler.
8	Preparation of reaction mixture.
9	DNA amplification.
10	Analysis of PCR products, Spectrophotometrically, Electrophoretically.
11	**(Gel Doc System)**
11-A	Principle, Handling & Precautions of Gel Doc.
11-B	Composed Components & their Functions.
11-C	Imaging and Documentation of Nucleic Acid and Protein.
11-D	Applications of Gel Doc System.
11-E	Discussion.
	(Cloning)
12	Restriction Digestion of Vector.
13	Insertion of PCR product into vector.
14	Ligation.
15	Preparation of competent cells.
16	Transformation of ligated vector into competent cells.
17	Blue-White screening.
18	Plasmid Isolation.

19	Discussion.
	Section B: (Proteomics)
20	Fermentation (Submerged & Solid State).
21	Downstream Processing (DSP).
22	Extraction of Crude Enzyme.
23	Partial Purification of Enzyme.
24	Precipitation of Enzyme (Salt & Solvent).
25	Dialysis.
26	Enzyme Assay.
27	Enzyme Kinetics.
27-A	Effect of pH on Enzyme Activity.
27-B	Effect of Temperature on Enzyme Activity.
27-C	Effect of Substrate Concentration on Enzyme Activity.
27-D	Effect of Activator on Enzyme Activity.
27-E	Effect of Inhibitor on Enzyme Activity.
28	SDS PAGE.

Module 12: "Hands-on Industrial Project/Dissertation work with State of Art Lectures" (Program Code: CRT-12).

NOTE: Candidates (CRT-12) will work on an assigned *Live Project* for Option-2 to 5. Projects will be related to following areas-

➢ Genetic Diversity	➢ Molecular Biology
➢ Industrial Microbiology	➢ Enzymology
➢ Plant metabolites	➢ Antibiotics
➢ Waste Management	➢ Bioremediation
➢ Biochemistry ➢ Forensic Science	➢ Food Technology ➢ Genetic Engineering
➢ Pharmacology	➢ Infection Biology & ➢ Other high demand areas

&

Biotechnology + Bioinformatics (Wet + Dry Lab)

Live Project/ Dissertation Work

(3 to 6 Months)

MRD LifeSciences™ provides a platform to all outstanding candidates who are doing Project/Dissertation work in our lab & help them to publish their papers in National & International Scientific Journals based on their findings of Projects.

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Module CBT: "Hands-on Industrial Training with State of Art Lectures on Customized Biotech Techniques" (Program Code: CRT-CBT).

Techniques Details: (For Duration of One Week/ 7 Days)

A. Bio-Instrumentation (Fee : Rs. 1,500/-) ● Introduction to Biotechnology and Allied Fields. ● Introduction to General Lab Rules and Sterilization Techniques. ● Handling and Operation of Bio-Instruments such as- Digital Weighing Balance, Micro- controller pH Meter, Digital pH Meter, Autoclave, Centrifuge Machine, Distillation Unit, Bacterial Incubator, Hot Air Oven, Water Bath, Shaker Incubator, BOD Incubator, Micro-Pipettes, Vortex Mixer, Magnetic Stirrer, Hot Plate Stirrer, Microscope, Colorimeter, White Light Transilluminator & Laminar Air Flow. ● Operating Highly Sophisticated Instruments such as Electrophoresis Units (Horizontal & Vertical), Digital UV-Visible PC based Spectrophotometer, Blotting Apparatus, UV Transilluminator, Thermal Cycler (PCR Machine) & Gel Doc. System.
B. Electrophoretic Techniques (Fee : 1,500/-) ● Buffer preparation ● Gel preparation (AGE & SDS PAGE) ● Sample preparation (DNA & Protein) ● Electrophoresis ● Observation of DNA & Protein Bands.
C. PCR & Gel Doc (Fee : Rs. 1,500/-) ● Preparation of DNA for PCR ● Programming of PCR protocol in Thermal Cycler ● Preparation of reaction mixture ● DNA amplification ● Analysis of PCR products, Spectrophotometrically, Electrophoretically ● Gel Documentation.
D. RNA Extraction & Analysis (Fee : Rs. 1,500/-) ● Preparation of RNAase free plasticwares & glasswares ● RNA extraction by kit / manual method ● Analysis of extracted RNA, Denaturing gel electrophoresis, Spectrophotometric method.
E. Bioprocess Technology (Fee : Rs. 1,800/-) ● Production of target enzyme by shake flask & solid state fermentation ● Extraction of crude enzyme ● Purification of crude enzyme, Salt precipitation, Dialysis ● Assay of purified enzyme.
F. Recombinant DNA Technology (RDT) (Fee : Rs. 1,800/-) ● Restriction of Genomic DNA & Vector ● Insertion of insert into restricted vector ● Ligation ● Preparation of competent cells ● Transformation of ligated vector into competent cells.● Blue-White screening.

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G. HPLC (Fee : Rs. 4,200/-) ● Introduction to Chromatographic Techniques & HPLC Components. ● Types of Pumps, Injectors, Detectors & their Functions. ● Types of Mobile & Stationary Phase to Separate the Compounds. ● Types of Column. ● Method Development for the Separation of Unknown Compounds. ● How to Select the Mobile, Stationary Phase & Flow Rate. ● How to Select the Gradient & Isocratic Methods. ● How to Select the Sample Volume. ● How to Select the Wave Lengths or Detectors.

Module BI: "Hands-on Industrial Training with State of Art Lectures in Bioinformatics" (Program Code: CRT-BI).

(Module-BI/ Program Code- CRT-BI)

Gets Enroll for BioInfo Training/Project/Dissertation Work

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Thanks

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